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☑ Additional comments / Commentaires supplémentaires:

Appendix No. 5, No. 7 & No. 9 are not printed.

In Appendix No. 1, page 79 is incorrectly numbered page 97.

In Appendix No. 6, pages 46-47 are incorrectly numbered pages 47 & 46.

APPENDIX

TO THE

EIGHTEENTH VOLUME

OF THE

JOURNALS

OF THE

HOUSE OF COMMONS

DOMINION OF CANADA.

FROM THE 17TH JANUARY TO THE 19TH APRIL, 1884,
BOTH DAYS INCLUSIVE.

BEING THE 2nd SESSION OF THE 5th PARLIAMENT OF CANADA.

SESSION 1884.

VOLUME XVIII.

APPENDIX.

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REPORT

OF THE

SELECT STANDING COMMITTEE

ON

IMMIGRATION AND COLONIZATION

OF THE

HOUSE OF COMMONS.

Printed by Order of Parliament.

OTTAWA:
PRINTED BY MACLEAN, ROGER & CO., WELLINGTON STREET.
1884.

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REPORT.

The Select Standing Committee on Immigration and Colonization respectfully submit their second and final Report:

On the subject of immigration, in relation to the number of arrivals and cost of the service during the last calendar year, the Committee examined Mr. John Lowe, Secretary of the Department of Agriculture.

They found by the evidence given by him that the numbers of immigrants entering Canada during the year 1883 were remarkable for their increase over previous years, being, in fact, the largest ever recorded.

The total number of the arrivals, that is, of immigrants intending to settle in Canada, and immigrant passengers who made use of the facilities offered by Canadian routes for the purpose of proceeding to the Western States, was 206,893 against 193,150 in 1882, and 117,016 in 1881, and 85,850 in 1880.

As respects the number of immigrant settlers simply, the figures for the year were unprecedentedly large, being a total of 133,303 as against 112,458 in the previous year, 47,991 in 1881 and 38,505 in 1880.

The immigrant settlers during the year included 34,987 who entered from the United States, making entries of settlers' effects at the Custom Houses, the names of the settlers, the numbers of persons in the family and the nationality being registered in all these entries; these figures being thus obtained by an exact registration, are absolute and show a very considerable movement from the United States to Canada, owing, doubtless, to two causes, one being ready employment in manufactories and on railway works, and the other the attraction of our lands in the North-West.

One feature of these entries with settlers' effects is the number of Germans, viz.: 14,640. It is found that the Germans make very valuable settlers, and when they successfully settle are sure to be followed by their friends; this nucleus is therefore considered to be important.

There were also amongst these entries 11,580 Canadians, these being returns of persons who had previously emigrated to the United States, and 1,798 American citizens who have immigrated into Canada.

The Committee made special inquiry respecting the assisted Irish immigration during the year, and they found that the total number of these immigrants was 6,359; part of these were assisted by Mr. Tuke's Committee, and part by the Irish Emigration Commissioners from the districts in the south and south-west of Ireland.

It appears that a large majority of all these immigrants have settled in the Dominion and done well; a portion of them, however, were unsuitable for immigration to Canada, and have received assistance during the winter from the local charities in Toronto. These comprise 106 male adults, 117 female adults, and 455 children, a total of 678; none of these appear to have been sent out by Mr. Tuke's Committee, but from the Workhouse Unions in Ireland.

The Committee find that the Government of the Province of Ontario agreed to receive these Irish assisted immigrants and find work for them, the Dominion Government agreeing to furnish them with assisted passages and guidance on their arrival.

The undertaking to settle this class of immigrants in Canada cannot be said to be a failure, in view of the large majority who have done well.

It should be pointed out that whilst the persons who received assistance during the winter were slightly over 10 per cent. of the whole of this assisted immigration, they formed a very much larger proportion of those who came from the Workhouse Unions alone.

It is further to be stated that the fact of so large a proportion of the Union immigrants requiring assistance, against none of those from Mr. Tuke's Committee, proves that many of the selections in the case of the former were unfortunate.

These comparisons, it will be observed, are confined to the assisted Irish immigrants.

There were numbers of other Irish immigrants who came to Canada during the year (12,695 having landed at Quebec alone), and who have, in common with other nationalities, done well.

The demand for laborers on farms and railway construction was not and could not be satisfied during the year, nor could that for the services of female domestic servants.

It appears that, in addition to their skill, the settlers who came to this country during the past year, brought with them money and effects to the large ascertained amount of nearly *three million dollars* there being also large unascertained amounts. An appreciable addition was thus made to the general wealth of the country, as well by the values brought by immigrants, as by those they created as producers, the returns they made to the Treasury as consumers of dutiable goods, and the stimulus afforded to the general business of the country by these producers for their own consumption.

The total amount expended on immigration for all services and establishments, for the last fiscal year, for which the vote of Parliament was taken, was $373,957. Of this amount, $72,326 was paid for assisted passages and commissions to agents, the commissions being a little over 20 per cent. of this amount, leaving a balance of about $50,000 paid for assisted passages.

It thus appears that a very small portion of the vote is expended for assisted passages; the balance of the expenditure being for publications, fixed establishments and the care of immigrants after arrival, which would be necessary if there were no assisted passages, and constitutes the bulk of the whole expenditure, which must be considered moderate in view of the extent of the service.

The Committee examined into the facts of the so-called exodus from Canada to the United States during the year, and they had laid before them, by Mr. Lowe, a series of important tables prepared by Mr. Hawson, Traffic Auditor of the Grand Trunk Railway Company, showing the through passenger traffic over the whole of the Grand Trunk system at both eastern and western points. These tables separate the persons who bought their tickets out of Canada and passed through to the United States, from those who purchased them in Canada and went from it to the United States and *vice versa*. A comparison of these figures, therefore, shows the net gain or loss of population by way of this railway system. It is not the only railway which has connections with the United States, but including, as it does, the old Great Western system, it affords a test of great importance as to the nature of the movement of immigration and emigration, and leaves no question as to the facts in connection with the alleged exodus at Port Huron.

The tables establish the fact that as respects the passengers passing through Canada *en route* from Eastern to Western States, and *vice versa*, there was a gain by the Western over the Eastern States during the twelve months covered by these returns of 14,228, thus showing a movement of a somewhat decided character from the Eastern to the Western States.

It appears that in the movement of passengers between Canada and the United States at all points touched by the Grand Trunk system, there was a net gain to Canada in the difference between the "ins" and the "outs" of 4,692; the figures which show this fact have never before been tabulated and published, and they fully establish a state of affairs wholly inconsistent with any theory of an exodus from Canada during the twelve months in question. On the contrary, the reverse is established.

It must, therefore, be manifest that whatever may have been the emigration from Canada during the last twenty-five years, as may be inferred from the figures published in the United States Census returns, there was none during the twelve

months ending 30th June last, but on the contrary, the evidence shows that we have made a gain during that period.

Respecting the alleged large emigration from Canada at Port Huron, of 45,393, during the twelve months referred to, as shown in a report published by the Treasury Department of the United States, over the signature of Mr. Jos. Nimmo, jun., the Chief of the Bureau of Statistics:—It appears from a comparison of the figures in the tables furnished by Mr. Hawson, that the net loss or emigration from Canada as shown by the difference between the "ins" and the "outs" at Sarnia was 7,222, for the fiscal year referred to. And it is probable that even this comparatively small number should be reduced by the fact that a considerable number of the French Canadians, who go to the Michigan lumber woods in the fall, return by steamers after the opening of navigation in the spring, instead of recrossing by the railway at Port Huron.

The conclusion as to the fictitious nature of the claims of the Washington Bureau, based on returns furnished by the Collector at Port Huron, is strengthened by two statutory declarations of officers who were engaged in making up these returns, which were put in evidence by Mr. Lowe. One declaration (that of Mr. C. H. Irwin), was taken before Mr. John Cowan, a Commissioner at Sarnia, and the and the other before Mr. G. A. Matheson, Collector of Customs at that port. The latter was received by the Committee without the name being attached, the signature of Mr. Matheson being accepted as proof that the document was what it purported to be.

The Committee summoned Mr. Irwin to appear before them for examination. He testified that he had been for about eight years a Deputy Collector of Customs at Port Huron, leaving that service in 1879, and for about ten years previously baggage master for the Grand Trunk Railway at the same place. He stated that during the greater part of this time he made up these returns, and that the figures he used were purely and simply fictitious, on one occasion his return having been sent back to him in order to have it made larger.

He stated that there was never even a pretence of asking any questions nor of making any registration; and further, that no attempts were made to count the numbers of emigrants or passengers, the whole proceedings being guess work. The other declaration stated that in getting up the returns the occupations were also guessed at and put down as so many carpenters, blacksmiths, painters, doctors, lawyers, preachers, &c., the remainder being called farmers. There was no evidence whatever on which to base such statements of the details of occupations as published by the Treasury Board at Washington.

This document further states: "The idea was to make the immigration as big as we could; in fact the whole thing was nothing but guess work."

Mr. Irwin, when before the Committee, was very closely and at considerable length cross-examined respecting the manner of making those returns, without, however, altering or affecting any point of his declaration.

A statement was put in evidence by Mr. Trow, signed by Mr. Frank Whipple, Deputy Collector at Port Huron, under date 7th March, 1884, certifying that the records of the office show that Charles H. Irwin, formerly a Deputy Collector and Inspector of Customs for the district of Huron, was removed from office, 15th April, 1879, and from that time until the date of the certificate said Irwin was never employed by the Customs at that point or Fort Gratiot.

This certificate of Mr. Whipple, it will be observed, does not contradict the statement made by Mr. Irwin in evidence, to the effect that three weeks after he left the service at Port Huron he was re-appointed as Customs Officer at Toronto, and continued in that position for three summers.

Mr. Irwin further states that he was not removed for incompetency or neglect of duty, but in consequence of his appointment lapsing at the time of the Presidential election, his place and that of several others being required to meet promises made by the Collector (Sanborn) to other parties whilst canvassing for his own appointment. Nothing of any kind was shown to invalidate his statements, and Mr. G. A. Matheson, who was subsequently examined, stated that he had known Mr. Irwin for

twenty years, and knew him to be a man who was "thoroughly reliable." He also made a similar statement with respect to the maker of the statutory declaration, whose name was withheld for personal reasons.

Mr. G. A. Matheson was examined; he stated that he had been Collector of Customs at Sarnia since July, 1874, and that previous to that time, from 1869, he was employed as Landing Waiter in the Customs Service at Point Edward.

He informed the Committee that he was thoroughly acquainted with what was going on at Port Huron, and that he had information similar to that furnished by Mr. Irwin, from other United States officers, which he was unable to use from personal reasons.

He further corroborated the statement made by Mr. Lowe, that no proceedings were taken at the crossing at Sarnia which would enable the United States officers to obtain the information in the detail which appeared in the published reports.

Mr. Lowe stated in his evidence, after reading the Statutory declarations referred to, that the information they contained as to the mode of fabricating the statistics in question, exactly coincided with that which he had obtained in 1880 at an interview with Mr. Stephen Avery, a United States Custom House officer actually engaged in furnishing the returns, such information being communicated in a conversation in the office of Mr. Marcus Young, a land and immigration agent at Port Huron.

The statement thus reported to have been made by Mr. Avery, was that no questions were asked, in order to obtain the details, which were required by the headings of the forms, furnished by the United States Government, to be filled up; for the reason that it was impossible to ask such questions and record the answers within the time afforded; that "twenty men could not do this on some days;" and further, that in making up the returns "required by the Government," he had to "arrive" at the information as best he could.

The Committee examined Prof. Arnold, of Rochester, N.Y., and Mr. W. H. Lynch, of Danville, Quebec, on the subject of the manufacture of cheese and butter, in relation to the agricultural interests of Canada, as bearing on the question of immigration. The evidence given by these gentlemen has already been submitted in the first report of the Committee; but in view of its importance, it is thought advisable to refer to it specially in this place.

The value of the carrying industry may be estimated by the fact that Canada exported, during the fiscal year 1882-83, no less than 8,106,447 pounds of butter, valued at $1,705,817, and 58,041,387 pounds of cheese, valued at $6,451,870, making a total of $8,157,687, or nearly 19 per cent. of the total value of the exports of the product of the farm during that year. And when we consider that in 1858 the export of cheese was only 13,104 pounds, valued at $1,497, some idea may be formed of the vast strides that have been made in the development of that industry.

These gentlemen estimate the loss to the farmers of Canada, through reduction in values, as the result of a careless and indifferent system of butter making, at about five millions of dollars annually, and Mr. Lynch is decidedly of opinion that this evil can be more effectually remedied by the exercise of greater care in private dairies, than by the extension of the co-operative system of public creameries.

The Committee requested the attendance of Mr. Schmothe, Professor of the Agricultural School of St. Anne's, Province of Quebec. He furnished the Committee with much information of value, which is submitted as part of this report.

Mr. J. C. Langelier, of Quebec, was also examined in relation to the resources of the country in the James Bay district, and also of Gaspé. The information he furnished in respect to the latter, was based upon his personal explorations, and was of particular value. He states that that very large area of country, known as Gaspesia, contains great agricultural and mineral resources; that it is well adapted in all respects for the home of a large population, with which (being easy of access and possessing an excellent climate), it will probably be filled in the near future.

The evidence of Mr. Wm. R. White, shows that there is still a large quantity of excellent land, available for settlement, in the free grant districts of northern Ontario.

Mr. Robert Romaine was examined in relation to a plan of colonization for the North-West, by laying out a series of villages along the line of the Canadian Pacific Railway, and any branch lines; he proposes that the farmers should live in these villages, having communication with their farms by a system of tramways, operated either by horse or steam power.

Mr. Romaine's scheme seems to possess some features of merit, and if it can be made applicable to the condition of things in the North-West would, doubtless, tend to reduce the cost of transporting grain to market.

The evidence taken before the Committee is submitted herewith as part of this report.

All which is respectfully submitted.

P. WHITE, *Chairman.*

COMMITTEE ROOM, HOUSE OF COMMONS,
April 15th, 1884.

MR. LOWE'S EVIDENCE.

NUMBERS OF IMMIGRANTS—THE IRISH ASSISTED IMMIGRATION—GERMAN AND OTHER IMMIGRATION—DEMAND FOR IMMIGRANT LABOUR—VALUES BROUGHT BY IMMIGRANTS—VALUE TO THE DOMINION OF IMMIGRATION.

OTTAWA, 22nd February, 1884.

The Committee on Immigration and Colonization met at 11 o'clock a.m., Mr. WHITE (Renfrew) in the Chair.

Mr. JOHN LOWE, Secretary of the Department of Agriculture, was called and examined.

By the Chairman:

Q. Can you state the number of immigrants who arrived in Canada during the year 1883, the ports at which they arrived, and whence they came?—Yes; and in reference to that question it is, perhaps, better to make a distinction before giving the figures. There are two sets of immigrants; or rather one set of immigrants who intend to settle in Canada, and another who are simply passengers using our routes to go to the United States. As both of those figures are necessarily given in all the statements furnished by the Department, it is better, I think, to bear that distinction clearly in mind. The total numbers of arrivals at all our ports during the year were marked by a very great increase over all previous years; in fact, it is the largest figure ever attained of immigration into Canada. The total number is 206,893; that is of both the sets of immigrants of whom I have spoken. The immigration of the year before was also very large, being 193,150, and 117,016 in 1881, 85,850 in 1880, 61,052 in 1879, and so on, against declining figures as we go back for some time. So that, in comparing even 1879 with 1883, we have 61,052 as against 206,893. Those numbers entered the country in this way: In 1883, *vid* the St. Lawrence, 45,966; *vid* the Suspension Bridge, 66,179; other inland ports not specified in this enumeration, 35,045; *vid* Maritime Province ports, 14,721; British Columbia, 9,000; and there were very large numbers of immigrants who entered their names in making entries of free goods at the Customs Houses, amounting to 34,987. That is also a much larger figure than in any previous year of entries of this nature, and it makes up the total to 206,893. These are the total figures of the two sets of immigrants.

Q. That includes those who came to the country and those who passed through it?—Yes.

By Mr. Sproule:

Q. Have you got them separate now?—The number of settlers in Canada during the year, as reported by our agents, is 133,303, as against 112,458 in the previous

year, 47,991 in 1881, and 25,504 in 1880. I should state that this is an estimate—and it is only an estimate, as we have no exact account of it—of the number of settlers who have entered into the North-West along the frontier, between the point of Emerson and the Rocky Mountains. Our agents report that the number of these is very considerable, and I am quite sure that in putting down 1,000 as against that unascertained number, we put it under the true figure, and that figure, I may state, is under the estimate of our agents.

By the Chairman:

Q. Can you give us any information in regard to what countries these immigrants came from?—Yes; we have the numbers of those who came by the St. Lawrence as the actual registration in the report of the Quebec agent, and these are tabulated. But in the absence of registration at other points, we have less assurance. There arrived at Quebec 29,003 immigrants from England; from Ireland, altogether, 12,095—that includes the ordinary immigration from Ireland, and the special immigration; from Scotland, 5,460; from Belgium, 848; in all, 45,947. Then we have also that precise information with regard to those enumerated in the Customs reports, and that is also of some interest. Of those who came in from the United States and made entries of immigrants' effects, there was a total of 34,987; among whom 14,640 were Germans. I may point out that that is a larger figure than we have had before of German entries from the United States.

By Mr. Hesson:

Q. Where were these entered?—At the Customs Houses.

Q. From the United States?—Yes; from the United States. Then there were 1,798 Americans and 11,580 Canadians—the latter are supposed to be repatriated, or returned Canadians—making in all, 34,987, bringing settlers' effects to the value of $1,153,632. These are exact registered figures.

Q. As actual settlers?—Yes; coming in with their household effects to settle in the country.

By the Chairman:

Q. Can you state generally the character of the immigration as respects its suitability for Canada?—On the whole, the character of the immigration was very good, and the exceptions to that rule were very slight, indeed; in fact, I might almost use the word insignificant, in relation to the total numbers.

Q. How does this compare with the immigration of previous years, both as respects numbers and character?—As respects numbers, it compares very favourably. It was not, however, better in character than the immigration of the immediate previous years; in fact, it was much of the same character, with the exceptions that I have mentioned.

Q. Can you give the Committee any information respecting the Irish immigration of last summer, how it was moved, and by whom assisted, and what were the total number of the Irish assisted immigrants?—I have already given you the gross figures of the Irish immigration, and now I will give you the special immigration. I have the exact figures by registration in the report of Mr. Stafford. The total number of Irish assisted immigrants during the last year was 6,359.

Q. Assisted immigrants?—Yes; that is to say, immigrants in part assisted by Mr. Tuke's Committee, and in part by the Irish Emigration Commissioners, from the congested districts in the south and south-west of Ireland.

By Mr. Hesson:

Q. Were all those arrivals at Quebec?—Yes; and each one of these—every member of the family—was given one pound sterling on landing.

Q. By Mr. Tuke's Committee?—By both the Unions' and Mr. Tuke's Committee. I should say, however, that previous to these people being brought out, Major Gaskill visited this country, on behalf of the Irish Commissioners, and Mr. Hodgkin, Honorary Secretary of the Tuke's Committee, accompanied by the Rev. Father Nugent, also came. These gentlemen went through the Dominion; they went to Manitoba and saw the Catholic authorities, and those authorities agreed to take and place a certain number of immigrants, which they did. They did the same thing at Toronto, the

operation as regards the placing of these immigrants being mainly undertaken by the Provincial Government of Ontario, the Federal Government undertaking to give them the most favourable rates of passage and care up to the point of their delivery to the Provincial authorities.

By Mr. Sproule :

Q. Do I understand you to say that the Catholic representatives took an interest in, and provided for placing a certain number of immigrants?—In Manitoba, yes; and the Provincial Government in Toronto, assisted by the Catholic authorities, did place all those who were placed in Ontario.

Q. Was the arrangement made previous to the immigrants being landed?—Yes.

Q It is said that at the present time there is a large number of this class of people in Toronto, who are unprovided for?—That statement, I think, is one which admits of a little limitation.

By the Chairman :

Q. Can you state the number of the destitute Irish immigrants now in Toronto, and how they came to be in such a condition, stating more particularly how these people came to be brought to Canada?—As respects condition, the Department has taken pains to obtain exact information, and that within a few days past. Mr. Donaldson, the agent of the Department at Toronto, and his assistant, have made a complete house to house visitation of all these people. The total number of Irish now in Toronto, who are not able to obtain employment—and with respect to these, I think it should be stated that some of them are what are called pauperized, and are not very willing, or in fact, not at all willing to work—the total numbers, however, of all the Irish in Toronto, now obtaining assistance, are 106 male adults, 117 female adults and 454 children. The total, 677.

By Mr. White (Hastings) :

Q. Are these the only immigrants looking for assistance now?—Not altogether; there are a few besides, precise information about which, I will give in a few moments. This information, I should explain, is obtained from a return furnished to us, name by name, by Mr. Donaldson, and it may be accepted as absolutely correct. These people are, for the most part, persons who came out from the Unions. I do not see in this list a single name of the selections made by Mr. Tuke's Committee. When Major Gaskill was out here, he made a distinct agreement with the Department that none should be sent out who were not both able and willing to work. Major Gaskill was told that in the then state of the labour market, if none were sent out except persons who were able and willing to work, they would, in all probability, be placed in a good position in Canada and be of advantage to the country, in view of the labour needs, and it was also pointed out to him that very large numbers of Irish people have already settled in Canada, and have greatly improved their condition thereby. The population of Irish origin in the Dominion is very nearly one-fourth of the whole. I should state that the arrangement made both with Tuke's Committee and with Major Gaskill, was that this should be an immigration of families, including the mothers and the children, and that each family should be accompanied either by one or two able-bodied persons, male or female, able and willing to obtain a living for the family. That was the condition, and the precise condition, arranged both with Major Gaskill, with Mr. Hodgkin, and with Father Nugent, and they all agreed as to the advisability of it. I may say, however, that previously to that, the action or policy of the Department, through its agents, had been different, in that we sought to get out first the workers, leaving them to send for their families afterwards, which they almost invariably did, and from this plan has resulted the very large Irish immigration to the continent of America within the last quarter of a century. If the young men or the young women of a family come out to America and earn money they strain every nerve to send back their earnings to the old country to bring the family out, and in that way many millions sterling have been remitted to Ireland; in fact, the great bulk of all the immigration of Irish to the continent of America has been moved in that manner.

By Mr. White, (Hastings):

Q. Have you got any of the kid-glove beggars in that list—the walking-stick beggars from England and Scotland, who will pay $5 to go to a ball, though it takes the last cent they have. There are a good many of these to be seen in Manitoba?—The point I wished to make was, that the exceptions to the rule of well-doing immigrants had been very small—in fact insignificant—and that these 677 are simply the residue of the 12,095 Irish immigrants who came to Canada this year, and of that 6,359 were specially assisted immigrants. I think it will be found that if you happen to get what is called the pauperised class from England or Scotland or the continental nations, you will find quite as large a percentage of the same sort of trouble.

By Mr. Ferguson, (Leeds):

Q. And over 400 of this lot are children?—Yes; and there are 106 males, and 117 females besides.

Q. A most trifling fraction of the entire immigration?—Certainly, as respects the whole immigration of the year; and only about 5 per cent, of the whole Irish immigration *vid* the port of Quebec.

By Mr. Sproule:

Q. I understood you to say that you had reason to believe that not many of those receiving assistance came out, or were sent out by Tuke's Committee?—We do not find a single name among them of those who were sent out by Tuke's Committee. They are entirely from those sent out by the Unions. We have a complete list name by name.

Q. I saw a report in one of the Toronto papers to the effect that a very large contingent of these was from the class sent out by Tuke's Committee?—I believe that statement is entirely erroneous.

By the Chairman:

Q. Can you tell us how these people came to be in a destitute condition?—All the Irish, with very few exceptions, who came to this country, were placed in situations in the surrounding districts by the Ontario Government, assisted by the Catholic priesthood, and afterwards they gradually drifted back to Toronto. That process of drifting back has been going on all winter. There is also one further fact as respects some of those people obtaining help in Toronto; that the husbands, or workers of the family, had gone to work on the railway works north of Lake Superior, and not having very easy communication with their families in Toronto, left them to the care of others.

By Mr. Ferguson, (Leeds):

Q. Can you give us information as to how many of this number are ordinary labourers, and how many are mechanics?—In the list furnished the Department by Mr. Donaldson, the bulk of them are ordinary labourers. In addition to those destitute Irish immigrants a list has been furnished by Mr. Donaldson, showing the number of English immigrants, and their families who arrived during the last summer and are at present being relieved by various charities in Toronto. A very careful enquiry has been made in each case, a list, name by name having been taken by Mr. Donaldson and his assistant. The total number of these is 40 males, 35 females, and 108 children.

By Mr. Cochrane:

Q. Are any of the females unmarried?—I think so.

By the Chairman:

Q. I think you stated that the most of those destitute Irish people who are in Toronto had come from the Unions in the old country. Can you tell us how they were sent out here?—Yes; they were sent out here under the agreement or understanding to which I have previously referred. They were sent out by the Unions.

By Mr. Hesson:

Q. Did you say Belfast?—There is one reported from Belfast, but the major part of them are from the west and south—from the congested districts in the south and west of Ireland.

By the Chairman:

Q. Is it not advisable, in your opinion, to take measures to prevent immigrants coming to Canada who are likely to be a burden to the country?—I think the only measures that could be taken were those which were taken in the agreement which I have mentioned, between the Department and those representatives who came out from Ireland; and that was to insist that each family should have in it one or two able-bodied workers, willing and able to assist the family. I am perfectly certain of this, that in all large immigrations there will be a considerable proportion of the very poor, and perhaps a percentage of immigrants who would not be so desirable as some others. This is absolutely to be expected, or at least it is a concomitant of all immigration, and it is found in the United States in the same way as we have found it here. Indeed my enquiries have led me to believe that in the United States they found even more individuals of the undesirable classes than we have; certainly, they have been called upon to expend vastly larger sums of money for the care of such people, in proportion to the volume of immigration, than we have had to expend.

By Mr. Sproule:

Q. What amount of assistance is given by this Government to each individual, under the assisted immigration that you have spoken of?—The Federal Government did not undertake to give any special assistance, other than giving them the ordinary assisted passages which was given to other immigrants; and it also was provided that they should refund a fixed sum for the transport from Quebec to Toronto, or other points, with the exception of Mr. Tuke's immigrants, in which case only one-half was undertaken to be refunded, simply because they undertook a larger and more particular care than the others.

Q. I understood you to say that those immigrants got one pound per head on landing?—That was given them by the Imperial authorities or Mr. Tuke's Committee. The money was remitted to Mr. Stafford and in some cases a little was given at Quebec, but sometimes it was sent on and given at Toronto by the immigration officers.

By Mr. Allison (Lennox):

Q. Did that extend to the two clases of immigrants you referred to at the outset?—This one pound per head was given by the Irish Commissioners to each immigrant. Mr. Tuke's Committee did the same.

Q. You said at the outset there were two classes of immigrants—those who went to the United States, and those who remained in Canada. My question is, does this one pound sterling extend to each of these classes or only to one?—Only to the assisted Irish immigrants.

By Mr. Sproule:

Q. For Canada?—I think it is extended also to those who went to the United States.

By Mr. Allison (Lennox):

Q. To those who went to the United States as well?—None went to the United States from Canada that I am aware of.

By Mr. Sproule:

Q. None that we assisted?—None at all.

By Mr. White (Hastings):

Q. You say that the home Commissioners gave one pound to each immigrant leaving the old country, no matter whether he went to Canada or the United States, and that we assisted no immigrants unless they settled in Canada?—Yes; the one pound assistance was given all, but we gave nothing but the assisted passage to Canada.

Q. Has any party a right to interfere with immigrants coming to this country, outside of the Government? Have we no authority to prevent people from injuring the character of the country, and thus preventing immigration from coming here?—I am afraid not; it is a free country.

By Mr. Daly:

Q. And none of the Irish were assisted who went through to the United States?—I am not aware of any of those who came to Canada going to the United

States; but those Irish immigrants who were sent by the Commissioners, to the United States, *via* United States ports, had a pound also given them.

Q. I want to know whether that pound went to any of the immigrants who landed in Canada, and went through from Canada and settled in the United States?—There were none of that class.

By Mr. Wilson:

Q. What means have you of arriving at the conclusion that all those who arrived at Quebec to settle in Canada did settle here, and that none went to the United States. I would like to know what means you have of ascertaining as to the fact that all those immigrants who were assisted by the Government really remained in Canada?—We have the record of the agents as to where they were distributed.

Q. But as to those who were assisted in the way of paid passages from Quebec to other parts of Canada—what means have you of knowing that they left Quebec on that pass and did not dispose of that pass and go to the United States?—The only answer I can give to that is the record of distribution at the various agencies in the country. The Ontario Government paid the inland transport of certain classes of immigrants. We only paid in the cases of the destitute to the nearest points at which they could find work.

Q. Then, have you any record of the fact that the parties to whom you gave assistance to those places, are the ones who reported at their destination?—Of course in every individual case that precise knowledge would be impossible, but when an immigrant ship arrives, an immigrant train goes forward with so many to one point of the country, and so many to another point, and from these points they are distributed, and of that we have a record.

By Mr. Daly:

Q. Is it a fact that they are accompanied in most instances after landing, to their destination by an officer of the Government?—Yes.

By Mr. Wilson:

Q. Do you know of any instances where assisted passengers have sold their passes to other parties instead of using them themselves?—We have no instance on record.

Q. I want to know whether your attention has been called definitely to the fact that assisted passengers have disposed of their tickets?—No—not in any single case. No report of that kind has been made to the Department.

By Mr. White (Hastings:)

Q. Has your Department thought it would be wise for them to loan a sum of money to assist those people during their first years of settlement in the country. I think this is a matter of very great importance?—That is a question which has commanded the very careful attention of the Department. In theory there is very much to be said in favour of it; in practice the very greatest difficulties are found. We have also some experience. The Department did make a loan to enable the Mennonites to settle in Manitoba, to the extent of very nearly $100,000. The vote of Parliament was $100,000, and nearly the whole amount was taken out, but that loan was made upon the security of Mennonites in Ontario of good standing, and upon the absolute assurance to the Department that no man who signed the bonds was not worth ten times the amount he signed for. That loan will be repaid. There was another similar loan made to the Icelanders upon the security of the Icelanders themselves. It was almost necessary to make that loan in order to save the Icelanders from want and starvation; in fact, from dying. That loan has not been repaid, but since that time the Icelanders have become a large and flourishing community in the North-West, and they have very largely helped their fellow countrymen to come out here, in fact, to the extent of 1,500 during the last year, which is also a marked feature of our immigration to the North-West.

Q. Would not that loan work as well in the case of the Irish as with the Icelanders and the Mennonites?—I think it would be found that practically, when the Government made a loan to individuals it might as well make a grant; and that what it did for one portion of the community it must do for another.

By Mr. Tyrwhitt:

Q. We hear a good deal about destitute immigrants in Toronto, and I think I understood you to say that they were destitute owing either to the scarcity of work or their unwillingness to work. Did I understand you to say that?—At the present moment both causes are in operation, but earlier in the season there was more work than labourers could be found for.

By Mr. Ferguson (Leeds):

Q. Is there any considerable proportion of these people—the full grown people—who are receiving assistance now who are unable, from disease or decrepitude, to work?—I think you will find scarcely any of that class in the detailed report which Mr. Donaldson has prepared, and which I submit. Very few such are mentioned.

Q. My attention was called, professionally, last summer to a poor fellow, who was one of a considerable number of the same class of immigrants. From enquiry, I found that they were narrow-ribbon weavers in the old country, and they appeared to be unfit for anything in this country, except to eat. They had been bred to the ribbon-weaving business for generations, and their minds seemed to have become about as narrow as the ribbon on which they were employed?—That is a statement to which, I think, a limitation should be made. The East London people, who were brought to this country about ten years ago, were very much of the same character and class, and they are almost all doing well now. During last summer Lady Hobart, a philanthrophic lady, who took a great interest in that emigration at the time, visited this country for the purpose of making a very careful enquiry into their condition, and she has since published a report, in which she states that the condition of well-being in which she found these people, who were the poorest of the poor when they came to the country, now altogether exceeds what she could have believed.

By Mr. Cochrane:

Q. Is there any agency by which families throughout Ontario who want hired girls can be supplied, and where is it situated?—Persons who want domestic help can apply to any of the agents of the Department, or to Mr. Spence, the agent of the Ontario Government, at Toronto, who deals with questions of that kind.

By the Chairman:

Q. Can you give us any information as to the nature of the demand for immigrant labour during the year, stating the Provinces in which it has been most active?—The demand for labour during the year was very great—indeed, from all parts—and it could not be satisfied. I speak now with reference to the older Provinces. In Manitoba, very shortly after the season opened, there was a very rapid rush of immigration, which subsequently met with a temporary check, but in all the old Provinces we had demands from every one of the agents, asking to have immigrants sent to their agencies to supply orders which they could not comply with. The agents of the Department have also just now been engaged in ascertaining the probable labour wants for the next season. I happened to receive a letter this morning from one of those agents, who gives a statement of a number of townships in Lower Canada, and he says that many of the mayors assured him that the farmers found it very difficult to obtain help to carry on their operations, and that there had been a special dearth of female servants. It is, I believe, an undoubted fact that a very much larger number of workers—that is laborers of all kinds—could have found employment in Canada during the last year, than came.

By Mr. Sproule:

Q. Are you aware what method is adopted to ascertain the numbers that are required in different localities?—The methods adopted are that the agents of this Department are instructed to place themselves in communication with the mayors or reeves or municipal authorities to find out what numbers of labourers or workers or servant girls are required, and the distribution is made upon the information obtained.

Q. I think the trouble seems to be that they are always sifted out by the time they come up into Ontario, and there are none left?—It is not the process of sifting out, but it is the destination of the immigrants before they leave the old country.

The bulk of those from Quebec who are free to take work or situations, go to Toronto as the main distributing point. It will, however, happen in certain cases that Mr. Wills, the agent in this city, or Mr. McPherson, of Kingston, or Mr. Daley, of Montreal, or others, will send requests to Mr. Stafford, the agent at Quebec, and Mr. Stafford, who is a man of experience and good judgment, will supply these as far as he can.

By the Chairman:

Q. How would you estimate the general value of immigrants to the country, and can you state the amount of actual values in moneys and effects which they bring with them. I think you have given us the statement of actual value?—So far as that information has been obtained by our agents, we find that the immigrants of this year have brought in money and effects—tools, &c.—a total of $2,784,881, or nearly three millions of dollars of actual values, so far as ascertained. But there were large amounts not ascertained.

By Mr. Wilson:

Q. Do you mean to say that these are assisted? We would like to have a designation between the one and the other?—The assisted form really a very small proportion of the whole.

Q. Will you take it for granted that everybody coming into the country, whether he be an immigrant or one coming into the country from the United States, gives a statement of the actual amount he brings in?—These are actual reports of the amounts which have been actually ascertained.

Q. Do you mean to say that they embrace every individual who moves into the country from other countries, and the amount of cash and property he brings in?—Certainly not; but only so far as the agents have ascertained it.

By Mr. Allen:

Q. Does this return of thirty-three thousand people who came from the United States, embrace those who came to work on the railways?—No; they are distinct from that.

By Mr. Wilson:

Q. If a person leaves this country temporarily, and goes to the United States or Europe, with the intention of returning in a few months, have you any way of designating him from an immigrant, or do you include his effects as so much brought into the country by an immigrant?—Of course it would be impossible to say whether or not any of those whose effects are included in this sum have been in the country before. It is possible that some persons who came in as ordinary immigrants might have been in the country before.

By Mr. Ferguson (Leeds):

Q. It would not amount to one-half per cent.?—I do not think so.

By Mr. Wilson:

Q. It merely establishes this fact, that your returns are very unreliable?—In reference to this point I will state that if the figures of our agents err in any respect, it is not in the direction of exaggeration, but, on the contrary, it will be by very greatly understating the amount actually brought in. It is calculated in the United States that the average values of moneys and effects brought in by the immigrants, that is, taking the paupers and children altoghther, is $60 *per capita*. If that rule were applied to the immigrants who settled in Canada during the last year, it would give an amount of nearly $8,000,000. The information I have supplied is that which we have been able to obtain so far as our agents could gather it.

By the Chairman:

Q. What estimate do you make of the value to the country of immigrants, apart from the possessions they bring in with them. I suppose that is largely a speculative value?—I think there are two methods of arriving at that information. An immigrant family which settles successfully in the country would earn and expend from $400 to $500 per family per annum—probably $500 would not be an excessive average, taking into account the work of the women and grown children. That family then, would be a contributor of from $75 to $100 a year directly to the revenue

of this country. If we take an estimate of five to a family we should have 20,000 families in an immigration of 100,000 people, and that would amount to $1,500,000 or $2,000,000 contributed directly to the revenue annually by that immigration. There is a still further point. The immigrant family as well as being a consumer is a producer. Possibly the point may appear more clear by supposing that family to be placed in the Province of Manitoba. A successful immigrant family would cultivate, after settlement, 100 acres. If you make an estimate in wheat, and take that as an average of twenty bushels per acre, which is about the return which may be expected in Manitoba, that 100 acres yielding twenty bushels of wheat to the acre would represent 2,000 bushels. That valued at 75 cents per bushel would give a value of $1,500. Of course there are many families which would not have sufficient thrift and energy to cultivate so many as 100 acres, but I do know myself of individual cases in Manitoba where a much larger area of land is cultivated by a family than 100 acres. If we suppose an immigration to be 50,000 successful settlers, you would then have a value, according to that kind of calculation, of $1,500,000 a year from 50,000 persons, or 10,000 families, taking the family at five. Of course we should not get in 50,000 immigrants, 10,000 families, so uniformily successful. I put the argument to show the possibility, and it is absolutely true that the tendency is in that direction. The majority of immigrant families are successful; and that success tends to the general prosperity of the country, and in every possible way it assists in quickening the manufacturing industries, and commerce, transportation over railways and canals, and creates values which in their turn pay wages to the workmen in the Eastern Provinces, who have sometimes, from apparent jealousy of new-comers, declaimed against encouraging immigration.

By Mr. Sproule:

Q. I apprehend the weakness of that calculation would be in the fact that immigrants rarely cultivate one-half of that quantity?—Perhaps none would do that in the first year. I stated that there might be some families who would not cultivate so much, and in all cases, I spoke of possible results after settlement. I put a fixed number for argument simply on which one can establish the value of successful immigration into the country.

By Mr. Ferguson:

Q. With average success they would reach that point in less than ten years?—I have known individual instances in which they have accomplished this in much less time than that.

By Mr. Wilson:

Q. Do you think, from your experience on this point, that you are borne out by the past in supposing that you will accomplish this result?—We certainly should not do it in every case; I merely mention this as a possibility. But even if the cultivation were very much less—say one-half, or one-third, or one-fourth less—the accumulation of values would still be very great; and as in point of fact during the last ten years they have been very great. The amount of wealth brought in and created by immigrants in Canada during ten years has been enormous, and the whole country owes very much of its prosperity to it.

Q. From your past experience, what number of successful farmers do you imagine we might safely estimate as receiving from this yearly immigration, so that we may have an idea of what we can expect in the future?—If we take the agricultural returns of Manitoba, to which I specially referred, for the last year they are very favourable as respects the whole farming population.

Q. The immigrant farmers?—Of course. In fact almost all the farmers in Manitoba are immigrants.

Q. Yes; but there are immigrants from the Dominion to Manitoba, and immigrants from other countries. We are talking now about the immigration from other countries. We are not taking into consideration those who were living in this country?—You will find that when the immigrants from Europe—either Scotch, English, Irish, or Germans—become accustomed to the country for two or three

years, they are in all respects, I believe, as successful as the people of this country. You will notice that I also used the term "after settlement."

Mr. Baker (Victoria) :

Q. As to those 9,000 immigrants into British Columbia, can you tell me whether or not they went direct to British Columbia, and how many went from Canada, and the nationality of each of the immigrants?—I have not brought that information with me, and I am not quite sure that I can obtain it. The figures which I have given were from the return of Mr. Jessop, the newly appointed agent at Victoria. I will endeavour to ascertain whether or not the information asked for can be supplied.

Q. Are they not partly Chinamen?—I believe part of them are.

The Committee then adjourned.

MR. LOWE'S EVIDENCE.—(*Continued*).

THE COST OF IMMIGRATION—MEANS TO PROMOTE GERMAN AND SCANDINAVIAN IMMIGRATION—THE ALLEGED EXODUS AT PORT HURON—STATUTORY DECLARATIONS FROM THE U. S. OFFICERS WHO RECORDED THE FIGURES.

OTTAWA, 28th February, 1884.

The Committee met. Mr. LOWE was again called.

By the Chairman :

Q. What has been the cost of the immigration service during the year, giving to the Committee the principal heads, as compared with that of the previous year?—We have two sets of accounts. One is on the expenditure of the fiscal year; that is, on the vote of Parliament; and the other is on that of the calendar year, as this better accords with the operations of the season's immigration. Possibly it would be better to give you both. The total expenditure for the fiscal year, that is, on the vote of Parliament, for immigration, was $373,957. In this item the commissions would amount to a little over 20 per cent., leaving only an amount of about $50,000 for assisted passages simply. The heads of expenditure for the fiscal year were: for the transport of immigrants, $67,719.26; for commissions and assisted passages the total amount expended was $72,326.55, and in this item the commissions would amount to a little over 20 per cent leaving only an amount of about $50,000 for assisted passages simply. The amount for printing and advertising in that year was $42,605; for sundry expenses connected with the care of immigrants after arrival, in furnishing meals, &c., $14,961; for services of agents in the care of immigrants in relation to colonization, $11,057; for expenses at the several agencies, $19,584; for expenditure at the London office, $20,706; for immigration agents and employees in Canada, $24,472; for contingencies of all Canadian agencies, $30,280. Montreal Women's Protective Immigration Society, $1,000. Salaries in the London office, $6,247. Salaries of agents in Europe, $7,733. Travelling and office expenses of agents in Europe, $16,420. This last item I notice in the Auditor-General's report is put down as travelling expenses simply; but it includes that important item for office expenses. Those are the principal heads for the fiscal year. The figures are slightly different, as made up in our accounts for the calendar year. According to these the total which has come within the calendar year is $429,954.94. Of course the two sets of accounts are composed of exactly the same constituent parts; it will happen, however, that there may come a greater expenditure in one half of the year than in another, but they amount to precisely the same figure. In the calendar year the total amount expended for all agencies was $88,321; for transport $59,742, together with a special Irish transport of $18,902. There is in the calendar year an item for publication of $94,454, but a portion of this was incurred in the previous year, the payments being made in this. The total contingencies in the calendar year, that is, the expense of all the agencies,

were $33,000. The total expenditure for commissions and assisted passengers in the calendar year was $68,128, and of this the proportion for commissions would be about 20 per cent., or over, thus leaving a comparatively small amount for the service of assisted passages. As compared with the previous years, to which your question has reference, the total expenditure in the previous calendar year was $346,542.72, as against $206,180.81 for 1881, the expenses having relation to the whole of the services for immigration both in Europe and Canada.

Q. Please state the number of publications issued during the year, giving a list of such publications ?—The total number of publications, of every kind, issued during the calendar year, was 2,534,070.

By Mr. Trow :

Q. Could you furnish the Committee with the cost of the respective publications issued during the year, and the amounts paid to the writers of them ?—I can furnish that information, but I have not brought it with me. I may, however, state that the amount paid to writers of pamphlets is quite insignificant ; so small have these sums been, if there are any during the year, that they are scarcely worth mentioning. The compilation has been almost all done in the Department, and all printing accounts have been audited and certified to by the Queen's Printer.

By the Chairman :

Q. Can you inform the Committee of the numbers and extent of similar publications issued by steamship and railway companies ?—I have that information, and the numbers are very large. The largest numbers by far are issued by the Allan line. I had a letter, however, by the last mail, from the manager of the passenger department of the Allan line, in Liverpool, requesting me not to give this information in detail for publication, which he had furnished me in a previous letter, so that I do not feel at liberty to give those details, except to say generally that the issue of publications is very large.

Q. And of a character calculated to promote immigration to Canada ?—Yes ; it is very good indeed.

Q. Please state, generally, the steps which have been taken to promote immigration from Germany and Scandinavia, or other parts of Europe ?—To obtain immigration, or rather to induce immigrants to come from the continent of Europe to Canada, or Manitoba, has been one of the chief difficulties of the Department, and our success in past years has not been by any means very large; that is, in inducing either German or Scandinavian immigrants to come to Canada. Within, however, the last two years, special steps have been taken to enlist the services of agents in Germany, and on the continent, which promise to be more successful. It is questionable, however, if it would be advisable to furnish for publication the details of the arrangement. There is also another difficulty which is proposed to be overcome, by affording a cheap rate from the seaboard to Manitoba. The rate which has in the past prevailed—which has been about $30 from the seaboard to Manitoba—has hitherto been found a bar to success. However, we had a larger number of German immigrants last year than in any previous year, and I think the number will go on increasing. There is also one further fact to mention as respects the very large stream of German and Scandinavian immigration to the United States, namely, that it has been mainly assisted by the members of families who had gone before, and who sent back what they call "prepaids," to enable their friends to join them. Of course, nothing of that kind can be done in Canada, to any extent, until a very strong nucleus of settlement is effected. I have no doubt that this will soon come, and it is found that the North-West is especially adapted to the German immigrants who have gone there, and these have for the most part sent home good reports to their friends. In fact, so much has that been the case, that one of the leading agents in Germany informed Sir Charles Tupper last summer that the reports which he had received from actual settlers in Manitoba had entirely dispelled the doubts—in fact, the disbelief which he had previously held as to the suitability of that country and climate as a field for German settlement. We think that is a fact of very great importance, and one which cannot fail to lead to good results. It is also a fact to be remem-

bered, that those German immigrants who have settled up the Ottawa did last summer remit very large sums of money to bring out their friends.

Q. What is the price of a passage from Germany to Canada?—It is not, by any means, a fixed price. The cheapest possible mode by which a passenger can come from Hamburg to Quebec and Manitoba would be by Liverpool, and then taking a Canadian assisted passage by Canadian steamers to Quebec. I am not in a position to give the actual quotations which will prevail this season, but I believe I am enabled to say that they will be more favourable than in the past.

By Mr. Hesson:

Q Why do you say you cannot make known the results of your arrangements with the Allans?—Simply because I think it would not be advisable to publish all the details of our business to the world. I think the business reasons which should govern the Department are those which govern the actions of business firms in their daily transactions.

By the Chairman:

Q. I suppose another influence which has militated against German immigration in the past has been the objection against German emigration to certain countries? —As to that, the German Government know pretty well what is going on, and I do not think they would have any greater objections to the subjects of the German Empire coming to Canada than going to the United States.

By Mr. Hesson:

Q. Have you the report of the German delegation who visited the North-West?—Yes; that has been published in German, and it is satisfactory.

By Mr Kranz:

Q. You have a report from one delegate who is a member of the German Parliament?—Yes; Mr. Spielburg.

By Mr. Watson:

Q. I suppose the number of immigration pamphlets issued by the Canadian Pacific Railway Company has also been very large?—Yes; they issue a very large number. I have not the figures of their operations.

By the Chairman:

Q. Can you give the numbers of settlers, during the year, in Manitoba and the North-West?—The total numbers entering into Manitoba and the North-West, as reported by our agents during the calendar year, amount to 50,428. We estimate, however, the number of those who returned at 17 per cent., which leaves a net settlement in the whole of the North-West, so far as we can ascertain, during the year, of 41,701.

Q. Can you give the numbers of immigrants who have entered Canada from the United States during the year, giving the particular ports at which they entered, and also the numbers who went from Canada to the United States, crossing by Port Huron or other ports?—That question has in part been already answered by me, that is, as regards the entries into Canada from the United States, as taken by the Customs returns, all of which, I think, you will find in my previous evidence. One part of the question, however, was not at all referred to in that statement, and that is as relates to the emigration from Canada to the United States. That brings up the old Port Huron question, in, however, a somewhat new form, and I have this time some particular information which I had not before. I find, from a statement in the annual report, published by Mr. Nimmo, of the Bureau of Statistics at Washington, that for the fiscal year ending 30th June, the number of immigrants who entered the United States from Canada was put down at 70,241, of which, as alleged, there crossed at Port Huron alone 45,393.

By Mr. Hesson:

Q. That is, as part of the whole number of 70,000 odd?—Yes. Those figures at Port Huron may be tested by and, in fact, are governed by, the numbers of passengers going both ways on the Grand Trunk system, which now includes the Great Western system, at Sarnia, the two roads converging at that point. I have here the original of a statement furnished to me by the Grand Trunk Company, and signed by

Mr. T. B. Hawson, the Traffic Auditor of the Grand Trunk Company, of their official record of passengers who crossed at this point, and I have no doubt those figures may be accepted as absolutely corerct.

By Mr. Wilson:

Q. You have no way, however, of determining whether these are actual settlers, or whether they are merely travellers going through on business?—I will endeavour to explain that point. There are, in fact, four sets of passengers, but there are two which mainly cover this point. In the first place there are the east-bound passengers through the Dominion, from the Western to the Eastern States. These have no reference to the persons who purchased their tickets in Canada and who left Canada. The total of the east-bound is 64,095. There is then a statement of the total west-bound passengers who passed from the Eastern to the Western States, making in all 118,052, but Mr. Hawson puts a note to the foot of this statement, in which he says that this figure includes 39,729 European passengers. If this number is eliminated it will leave a remainder of 78,323, making a difference of passengers from the Eastern States to the Western States of 14,228; in other words, a gain in favour of the Western States of 14,228.

By the Chairman:

Q. But that does not affect Canada at all?—No; but as these figures have been so mixed up, the comprehension of the whole would not be clear without taking them in. And to further simplify the matter, this year Mr. Hawson has entirely separated for me the passengers who went over their lines into Manitoba. We come now to those who purchased tickets in Canada and went to the United States; and in the first place, the total number of passengers from Canada to the United States, by the whole of the Grand Trunk system, that is, taking in Windsor as well as Sarnia, was, during the year, 202,259. But from this Mr. Hawson says we must deduct, for passengers who purchased their tickets in Europe, 14,324, leaving the net total number of passengers from Canada to the United States of 187,935. On the other hand, the total number of passengers who purchased tickets in the United States to come to Canada was 194,162, from which Mr. Hawson says another deduction of 1,500 must be made, for persons who had purchased through tickets. If we eliminate these, we find that the two net totals are as follows:—Total number of passengers who went from Canada to the Western United States, 187,935, against 192,627, leaving an actual gain to Canada, in the difference of passengers between the ins and the outs, of 4,692 during the year. These figures point to an immigration from the United States instead of an emigration, as the Grand Trunk, including the Great Western, is a very important arterial communication at both eastern and western points. Coming to the question of the particular point of Port Huron, to which so much controversy has been directed in recent years: according to the report of Mr. Hawson, the total number of outs from Canada at that point was 47,484, from which 9,066 passengers, holding through tickets from Europe, must be deducted, they having entered at Quebec. That would leave a net of 38,777 outs, against 31,555 ins at the same point, making the loss in the whole year 7,222, against the claim of 45,393, published in the report of Mr, Nimmo, of the Washington Bureau.

By Mr Trow:

Q. That statement would hardly include the exodus from New Brunswick, Nova Scotia and Prince Edward Island. You have reference only to those who went from Quebec and westward?—It would include all from those Provinces who went west by the Grand Trunk. But in so far as we have obtained figures from the Maritime Provinces for the last two years, they are of similar character. The figures I have given refer to the whole of the Grand Trunk system, and the particular ports of entry and departure will be found in the statements I submit, and these afford an important indication of the general movement.

By Mr. Auger:

Q. Have you the number of immigrants who went by the Central Vermont and other lines to the Central States from Canada?—Those are included in these statements, as that line connects with the Grand Trunk system. There is one further

fact which I believe it my duty to state to the Committee. I had occasion, in my enquiry into the particular facts of this information, to endeavor to ascertain how it was got, and some of my enquiries which I then made were supplemented by Mr. Matheson, the Canadian Collector of Customs at Port Huron, who kindly consented to do what he could for me in that way. Those enquiries have led to a voluntary statement from one of the United States officers, who had been charged with getting the information, the original of which I now hold in my hand. It is a statement made by Mr. C. H. Irwin, and perhars I had better preface it by reading the statutory declaration, which is as follows :—

"I, Charles Harrison Irwin, of the City of Port Huron, in the County of Huron, in the State of Michigan, gentleman, do solemnly declare :—

"(1) That the statement of facts set forth and contained in the hereunto annexed paper writing, marked "A," and signed by me is true and correct.

"(2) The statement of facts set forth in the paper writing hereunto prefixed marked "B," and signed by me, is also true and correct.

"And I make this solemn declaration conscientiously believing the same to be true, and by virtue of an Act passed in the thirty-seventh year of Her Majesty's reign, intituled 'An Act for the suppression of voluntary and extra judicial oaths.'

"C. H. IRWIN."

"Declared before me at the Town of Sarnia, in the County of Lambton, this 7th day of November, A.D., 1883.

"JOHN COWAN, *A Commissioner*."

The statement declared to in the above is as follows :—

(B)

"PORT HURON, 5th November, 1883.

"G. N. MATHESON, Collector.

"DEAR SIR,—As you request me to give you a full account of the manner in which I used to make up the emigrant reports for the port of Port Huron, I will try to explain, as well as I can, how it was done.

"I was Baggage Master for the Grand Trunk Railway at Fort Gratiot for nearly ten years, and during the latter part of that time I, at the request of the Deputy Collector in charge at Fort Gratiot, made up the emigrant report for him.

"I was then appointed Deputy Collector of Customs at Fort Gratiot, which position I held for eight years, and during the whole of that period I made up all and every report of emigrants arriving by the Grand Trunk Railway.

"You ask what method I used, and what data I had to go upon in making up the emigrant report. I answer none; it was simply arrived at by taking the four quarters of the year, and allowing more for the summer, spring and fall quarters, than for the winter, as the ocean steamers could not land at Quebec or Montreal during the winter. In reply to your query as to whether or not any attempt or pretence was made of counting the number of emigrant passengers, I would say that I never, during my term of office, saw or heard anything of the kind being done.

(A.)

"I was told to estimate what I thought was the number of emigrants that arrived from all trains, &c., for the quarters ending 31st March, 30th June, 30th October and 31st December, as each ensuing quarter came round, and was given to understand that an increase in each quarter corresponding with the quarter of the preceding year was required to be shown.

"On one occasion my report was sent back to me, with instructions to put in more females and children. I asked jokingly where I was to get them, and was told to manufacture them. In fact, the whole matter was treated as a joke. Some one

would say to me 'where do you get your facts in the case?' And I would reply that figures were facts and could not lie.

"I attach a copy of the report, such as I used to send to the Custom House at Port Huron, where it was compiled with the reports from the other ports in the district. Of course you will understand that the figures in the copy are fictitious, and are merely given as an example.

"The foregoing is a perfectly true statement, and comprises the whole and the only method by which the emigrant statistics were collected at this port. If I have omitted any information you may require, let me know and I will be glad to oblige you by giving it, if it lays in my power.

"Yours truly,

"C. H. IRWIN."

I have here a copy of the report to which reference is made in this statement, and you can see that so many emigrants are put down as having come from Ireland, so many from Sweden, England and Scotland and so on, until it gives a total of 12,760 males, 8,720 females, or a total of 22.480. Of course these figures are fictitious, having been arrived at by guess work, as Mr. Irwin states.

REPORT of Emigrants entered at the Port of Port Huron, for the Three Months ending June 30th, 1883.

Where From.	No.	Where Going.	No.
Germany	3,672	Michigan	2,512
Norway	2,716	Iowa	2,830
Sweden	1,940	Illinois	3,575
England	1,612	Nebraska	1,890
Ireland	1,027	Indiana	715
Scotland	439	Ohio	660
Denmark	960	Wisconsin	2,245
Russia	510	Kansas	2,440
Italy	180	California	1,710
France	390	Dakota	1,230
Spain	150	Colorado	1,785
Portugal	108	Minnesota	896
Ontario	2,950		
Quebec	4,089		
Nova Scotia	1,725		

Males	12,760
Females	9,728
Total	22,488

MEM.—The above is a rough specimen of how emigration reports were sent in by me to the Custom House, Port Huron, and I may add that the above figures, made by guess, are just as reliable as those sent in the above mentioned reports.

C. H. IRWIN.

By Mr. Ferguson:

Q. Did you ask the date of the report?—It is dated November 5th.

By Mr. Trow:

Q. Is not that system of collecting statistics similiar to that which was carried on prior to 1878?—It seems to have been the practice. I have for some time had information of precisely the same character as that which I have now read to you, and which I obtained from other United States officers, but up to this time I have

not been in a position to make use of my information in any form, except a statement made to me by Mr. Stephen Avery.

By the Chairman :

Q. Does Mr. Irwin say that he was instructed to increase the quantities in each quarter?—He says on one occasion the report was sent back to him to do so.

By Mr Hesson :

Q. Do I understand you to say that he is still discharging his duty?—Of that I cannot say, but I think not. I have in my hand another declaration by a United States officer before Mr. Matheson, the Collector. The maker of this, however, for personal reasons, declines to have his name appear, so that it is for the Committee to say whether they will allow me to read this declaration without the name of the declarator, but with the name of Mr. Matheson attached, before whom he made the declaration.

By Mr. Ferguson :

Mr. Matheson is a Canadian Commissioner?—Yes; and I have the name signed to the original declaration in my hands now. I have no doubt as to its being *bona fide* what it purports to be.

The statement was ordered to be read.

Mr. Lowe then read the following statement:—

"I, ————————, of the City of Port Huron, in the State of Michigan, one of the United States of America, do make the following statement, solemnly declaring the same to be absolutely true in every particular:

"I occupied the position of Deputy Collector in the United States Customs for a period of about six years, during which time I was stationed at the Grand Trunk ferry at Fort Gratiot; among my duties was that of preparing the quarterly statement of immigrants entering the country at Fort Gratoit *viâ* the Grand Trunk Railway. The method in which the statement was compiled was as follows: As regards foreign immigration, the agent or interpreter accompanying the people from Quebec or Montreal, gave us simply the number of souls by his train, distinguishing their nationality, so many Swedes, so many Norwegians, so many Germans, &c., &c. I took his statement and formed an estimate of their ages, sex, trades, or professions, and filled those items in the return to the head office at Port Huron. With regard to the immigrants from Canada, the statement was got up from a guess at the probable number of passengers on the different trains. We would average, say six cars to a train, and sixty people to a car, and call half of the whole lot immigrants. At certain seasons of the year, when travel was light, the average would, of course, not be put so high, but the whole thing all through was nothing but guess work. We never pretended to make a count of the passengers, to know whether they were immigrants or not; in fact, it was impossible, as we had neither men nor time enough to do such a thing. Charles Irwin and myself got up these returns entirely by guess work, and copying off the old returns, and before my time he helped Crawford and others of my predecessors to get them up. The idea was to make the immigration look as big as we could. I know myself of large crowds of men going to the lumber woods in the fall who were taken as immigrants, although we knew perfectly well that they would all go back to Canada in the spring. In getting up the returns, the way we got at the occupations of the immigrants was this: we took so many thousand persons, and called so many of them carpenters, so many blacksmiths, so many painters, &c., so many doctors, so many lawyers, so many preachers, &c., &c., and the balance we called farmers. In fact, the whole thing from beginning to end was nothing but the purest guess work.

"(Signed), ————————.

"Declared before me, at Sarnia, this 18th day of December, 1882.

"(Signed), GEO. N. MATHESON,
"Collector of Customs."

By Mr. Wilson:

Q. And this has been carried on for eight years?—I fancy it has. In the first report which I made on this subject I gave the declaration of a Deputy Collector, Mr. Stephen Avery, made to myself, from notes which I made at the time. That declaration was made in the presence of Mr. Marcus Young, a land and immigration agent at Port Huron, who is now an available witness. It was substantially to the same effect as the two declarations I have just read. It did not go into quite the same detail, but the purport of it was precisely the same. In my report for 1880 I called particular attention to Mr. Avery's statement; and I did in the most positive terms challenge a contradiction of it. I did so the next year and also the next; and so for three years in all, but up to this time that statement has not been disputed. I may observe, with respect to the declaration which I have submitted without the name, that I have had other and similar statements from other United States officers which I could not use; and I mention this to say that if there were an authorized investigation the facts would appear. I am informed, however, by Mr. Matheson, that there was no objection to any use whatever being made of the statement, the only reservation being that the name should not be published.

By Mr. Paterson (Brant):

Q. Do I understand you to say that the men who made those affidavits were discharged United States officers?—I do not know. I stated that the declarations were handed to me by Mr. Matheson; and that I myself did obtain precisely the same facts from other officials who were then in the employ of the United States Government.

By Mr. Trow:

Q. What conclusion have you arrived at after an examination of these declarations or affidavits, made by these two individuals? Do you think they are telling the truth, and that all the United States statistics on this subject heretofore have been unreliable?—That is my opinion, and has been, for years, as respects the Port Huron immigration figures. In fact I have no doubt that these figures have for some years been simply fabricated. As respects a period four or five years past, I have had this information from United States officers; and the fact was indubitable from the declaration of a United States officer, Mr. Avery, which I published in my report for 1880.

Q. What reason have you to believe that the figures of the immigration to Manitoba are more reliable?—For the returns of immigration to Manitoba we have an actual count by an officer of the Department, Mr. Woodman. He is a careful and a reliable man; and the instructions are that he shall not in any way exaggerate, but shall furnish the Department with the exact information. We also apply to those figures the same kind of tests that I have applied to the figures at Port Huron, and we find that there is nothing in that criticism which invalidates the report which has been given to us by the agent.

Q. Do you think it is possible that he could interview four or five hundred passengers while the train is passing through the station?—No; he cannot interview every individual passenger, but he may make an actual count, and he does interview very many of the passengers.

By Mr. Farrow:

Q. Cannot the Department place an officer at Emerson and other places to make a registration, distinguishing between visitors, or tourists, and *bonâ fide* immigrants?—We have considered that point very carefully, and we do not think an actual registration possible.

Q. Why?—It would take a very long time in which to do it, and there are other difficulties.

Q. Let him go on the cars along with the train, till he completes the enumeration, and then return by the next train?—The officer does go on the cars, meeting them at St. Vincent, and he has about an hour to do his work in.

By Mr. Ferguson:

Q. I assume the best evidence is that the population in increasing far beyond the natural increase, whether they are tourists or settlers?—Yes; that is a test of immi-

gration. And we have obtained from the General Manager of the Canada Pacific Railway Company, a report of the ins and the outs at the points of Emerson and Port Arthur, or the common point of Winnipeg, and the difference between those two figures was rather over than under the count of our agent.

By Mr. Armstrong:

Q. Does the Department pay this gentleman, whose duty it is to board the trains and make a guess of the passengers, for his services?—He is an officer of the Department and is paid for his services; but he does not guess.

Q. And paid a salary for his services?—Yes.

Q. Have you a guess of their destination as well? I submit that if you can afford to pay a salary for guessing, a little more trouble and expense might secure for us reliable statistics on the subject?—No guesses are made. We have not the destinations of the passengers. I think the officer could not obtain them all.

By Mr. Ferguson:

Q. Is there not a registration made of the number of actual homesteaders, together with the sales of land by colonization companies, and the purchases from the Canadian Pacific Railway Company, and if so, could not this be utilized in compiling the returns of immigration to Manitoba?—There is such registration, I believe, but I don't think we could make it available. My own opinion is, the only practical test is the difference between the ins and the outs.

By Mr. Cochrane:

Q. I understand there is an actual count made?—Yes.

Q. And this gentleman makes an actual count, but he does not know what are their occupations, or their destinations?—He makes an actual count and generally ascertains where the major part of the passengers come from.

By Mr. Wilson:

Q. This man is stationed at St. Vincent and Emerson?—Yes.

Q. There is only one man there, is there, and he has to keep count of all the passengers who go in by the cars at that point?—Yes.

Q. What about crossing at Gretna?—We also get those crossing there from one of the officers, but not many went that way last year.

By Mr. Armstrong:

Q. It cannot be a very difficult thing for the official merely to count the whole number of those who go in by rail at Emerson, if that is all he does?—He does not take the whole numbers; he does not take the numbers of those he knows are not immigrants.

By Mr. Cameron (Middlesex):

Q. Is the agent still at Emerson, and does he remain there during the winter?—Yes.

Q. Would it not be advisable to bring him here, as we are going to bring that other official whose evidence has been submitted by proxy?—He could give you nothing more than the figures, which are corroborated by those furnished by Mr. VanHorne, the General Manager of the Canada Pacific Railway, as to the difference between the ins and the outs.

Q. I think the instructions that were issued by the Department to their agent at this point should be laid before the Committee?—The instructions are simply Departmental, and in part verbal. Mr. Têtu is our agent, and Mr. Woodman is the officer, and they obtain these figures for the information of the Department. We expect from our officers care and accuracy, and certainly no attempts are made to deceive us.

Q. Would it not be some advantage to us to have the specific instructions under which the officer acts?—Many of those instructions are, as I have stated, verbal. There may be some Departmental letters. I have, myself, had personal interviews with Mr. Woodman each year for three or four years, and each time I have given him special verbal instructions in the sense that I have explained to-day.

Q. Is he expected to find out the occupations of those who enter the country?—He has done that to a large extent, with respect to the passengers in the immigrant cars.

Q. How does he secure that information?—He asks the question within the time at his disposal.

Q. You see it has been pretty fairly proved here that many of those who went through were not asked any questions at all by the officer?—Yes; but the officer who performed that duty would probably not ask any questions of those members of the Committee who have spoken, and probably would not go in the Pullman car. The officers soon learn who are *bonâ fide* immigrants and those who are not.

Q. Could he tell whether a man was a printer or a tailor?—He might require to ask him.

By Mr. Watson:

Q. Does he make a return of the number of men, with their occupations?—No; it is only respect to their nationalities, and whence they come. He makes no return as to occupations.

Q. There were a good many people employed on the railway in the North-West?—Undoubtedly.

Q. I suppose those are also counted?—I believe so. They are referred to in the report of Mr. VanHorne.

Q. Are the numbers given?—Yes; in that report. But they are not distinguished in our Emerson report.

By Mr Baker (Victoria):

Q. I would like to ask how the circulation of the 100,000 pamphlets on British Columbia has been conducted—where they have been sent to, and in what number?—They have been sent mainly to the United Kingdom and in fact more than 100,000 have now been distributed. Comparatively few of those pamphlets have been distributed on this side, the bulk of them having gone to Europe.

Q. To the United Kingdom?—Yes.

Q. Have any been sent to the continent of Europe?—Yes; and the pamphlet is now being translated and published in German for circulation on the continent.

Q. But none have been sent up to the present moment?—Not of the translation I refer to yet, although extracts from it have been made relating to the Province of British Columbia, and have been inserted in very numerous pamphlets printed in the Scandinavian and German languages, but that special and particular pamphlet is now in course of being printed in German.

Q. Then the bulk of the first impression of those pamphlets has gone to the United Kingdom?—Yes.

Q. You said at the last meeting that you would be good enough to tell the particular nationalities of the 9,000 immigrants who went into British Columbia, and whether they went there direct or through the Eastern Provinces first?—I have not obtained that information yet, but I will endeavour to do so for the next meeting.

The Committee then adjourned.

The following are the tables and documents submitted by Mr. Lowe in evidence:—

GRAND TRUNK RAILWAY OF CANADA.

STATEMENT of East-bound Passengers passing through the Dominion, *en route* from Western to Eastern States.

Leaving at	Entering Canada at						Total.
	Sarnia.			Windsor.			
	Half-year ending Dec., 1882.	Half-year ending June, 1883.	Total.	Half-year ending Dec., 1882.	Half-year ending June, 1883.	Total.	
Sherbrooke	10	4	14	4	4	8	22
Coaticooke	1,305	779	2,084	1,177	268	1,445	3,529
Sutton	139	217	356	15	20	35	391
St. John's	1,775	1,613	3,388	424	463	887	4,275
Prescott	632	352	984	363	191	554	1,538
Suspension Bridge	6,001	4,676	10,677	27,856	15,807	43,663	54,340
	9,862	7,641	17,503	29,839	16,753	46,592	4,095

STATEMENT of West-bound Passengers passing through the Dominion, *en route* from Eastern to Western States.

Entering at	Leaving Canada at						Total.
	Sarnia.			Windsor.			
	Half-pear ending Dec., 1882.	Half-year ending June, 1883.	Total.	Half-year ending Dec., 1882.	Half-year ending June, 1883.	Total.	
Sherbrooke	186	43	229	13	4	17	246
Coaticooke	2,129	1,992	4,121	984	190	1,174	5,295
Sutton	426	266	692	9	27	36	728
St. John's	3,774	5,468	9,242	1,070	693	1,763	11,005
Prescott	1,133	1,022	2,155	999	249	1,248	3,403
Suspension Bridge	12,256	16,523	28,779	38,363	30,233	68,596	97,375
	19,904	25,314	45,218	41,438	31,396	72,834	*a* 118,052

a. Includes 39,729 European passengers.

T. B. HAWSON,
Traffic Auditor.

GRAND TRUNK RAILWAY OF CANADA.

THROUGH PASSENGER STATISTICS.

Passengers from United States to Canada.

Entering at	Half-year ending Dec., 1882.	Half-year ending June, 1883.	Total.
Sherbrooke	2,202	2,099	4,301
Coaticooke	8,053	6,312	14,365
St. John's	31,010	18,203	49,213
Prescott	374	346	720
Port Hope	198	51	249
Toronto	1,443	609	2,052
Suspension Bridge	28,011½	29,267½	57,279
Sarnia	18,948	12,607	31,555
Windsor	18,629	15,799	34,428
	108,868½	85,293½	*a* 194,162

Passengers from Canada to United States.

Leaving at	Half-year ending Dec., 1882.	Half-year ending June, 1883.	Total.
Sherbrooke	2,228	3,174	5,402
Coaticooke	9,715	6,140	15,855
St. John's	31,576	18,563	50,139
Province Line	110	169	279
Prescott	370	408	778
Port Hope	69	13	82
Suspension Bridge	27,820	24,639	52,459
Sarnia	27,325	20,518	47,843
Windsor	15,756	13,666	29,422
	114,969	87,290	*b* 202,259

a. Includes 1,535 European passengers. *b*. Includes 14,324 European passengers.

T. B. HAWSON,
Traffic Auditor.

GRAND TRUNK RAILWAY OF CANADA.

PASSENGERS from United States to Manitoba, all-rail, through Canada.

Entering Canada at	Leaving Canada at						Total.
	Sarnia.			Windsor.			
	Half-year ending Dec., 1882.	Half-year ending June, 1883.	Total.	Half-year ending Dec., 1882.	Half-year ending June, 1883.	Total.	
Coaticooke	10	48	58	19	8	27	85
St John's	12	215	227	62	1	63	290
Prescott	11	5	16	1	1	2	18
Suspension Bridge	37	51	88	16	26	42	130
	70	319	389	98	36	134	523

PASSENGERS from Manitoba to United States, all-rail, through Canada.

Leaving Canada at	Entering Canada at						Total.
	Sarnia.			Windsor.			
	Half-year ending Dec., 1882.	Half-year ending June, 1883.	Total.	Half-year ending Dec., 1882.	Half-year ending June, 1883.	Total.	
Coaticooke	7	21	28	3	.....	3	31
St. John's	20	26	46	10	7	17	63
Prescott	3	1	4	.....	1	1	5
Suspension Bridge	9	17	26	39	78	117	143
	39	65	104	52	86	138	242

T. B. HAWSON,
Traffic Auditor.

GRAND TRUNK RAILWAY OF CANADA.

PASSENGERS from Eastern Provinces of Canada to Manitoba, all-rail, *viâ* United States.

Leaving Canada at						Total.
Sarnia.			Windsor.			
Half-year ending Dec., 1882.	Half-year ending June, 1883.	Total.	Half-year ending Dec., 1882.	Half-year ending June, 1883.	Total.	
4,137	8,253	12,390	2,107	2,331	4,438	16,828

PASSENGERS from Manitoba to Canada, all-rail, *viâ* United States.

Entering Canada at						Total.
Sarnia.			Windsor.			
Half-year ending Dec., 1882.	Half-year ending June, 1883.	Total.	Half-year ending Dec., 1882.	Half-year ending June, 1883.	Total.	
1,477	1,906	3,383	1,586	2,048	3,634	7,017

STATEMENT of East-bound Tourist Passengers passing through the Dominion, *en route* from West to East.

Entering Canada at Toronto and Leaving at	Half-year ending Dec., 1882.	Half-year ending June, 1883.	Total.
Sherbrooke	80	.....	80
Coaticooke	289	29	318
St. Johns	1,457	357	1,814
Sutton	1	5	6
Prescott	32	.....	32
	1,859	391	2,250

T. B. HAWSON,
Traffic Auditor.

The foregoing are true copies of the originals, now on file in the Department of Agriculture, submitted by me in evidence.

J. LOWE.

REPORT.

The Select Standing Committee on Immigration and Colonization respectfully submit their first Report.

The Committee has examined Prof. L. B. Arnold, of Rochester, N.Y., and W. H. Lynch, Esq., of Danville, Quebec, in relation to the manufacture of Cheese and Butter, and deeming the evidence given by those gentlemen to be of much importance to the Agricultural interests of Canada, as well as having an important bearing on the question of Immigration, beg to submit the said evidence as part of this Report.

P. WHITE, *Chairman.*

COMMITTEE ROOM,
HOUSE OF COMMONS, March 19th, 1884.

HOUSE OF COMMONS, OTTAWA, February 29th, 1884.

The Standing Committee on Immigration and Colonization met this morning in Room No. 6, Mr. WHITE (Renfrew) in the Chair. Prof. Arnold, of Rochester, N. Y., was called and examined.

By the Chairman:

Q. Will you kindly state to the Committee your name and professional position?—My name is L. B. Arnold; my business is agriculture, and I am chiefly concerned with dairying.

Q. Would you state to the Committee what, in your opinion, are the relative advantages of the new and improved methods of butter and cheese-making, as compared with the old methods?—It would be very difficult to give anything precise on that subject, yet the advantages have been great. The facilities for manufacturing, and the art of producing a superior article of cheese have been very much advanced within a few years.

Q. What is the relative differences in quantities, and the difference in prices; that it to say, the difference in quantities under the present methods and the difference in prices of the improved qualities of butter as compared with those produced under the old system?—The difference in quantity per capita has not varied very much taking the country at large. The difference in quality has made a considerable difference in prices. The increase in quantity has been very great, but the population has been all the time increasing, so that there is an approximation towards a uniform percentage of increase.

Q. Could you inform the Committee of the approximate yield per cow of the ordinary grade breed of cows, and also with respect to animals of superior breed, in butter and cheese?—I do not know exactly what the average is in Canada, but, as shown by our census, the average in the United States is 300 lbs. of cheese per cow, and 160 lbs. as the average product of cows devoted exclusively to butter-making. I think yours is about the same, and perhaps a little higher. I see by some statistics noticed recently, that your average is a little higher than ours—as 160 to 182. A few superior dairies make double these quantities of butter, or of cheese.

Q. Could you inform the Committee of the conditions of herbage and water necessary to produce the best qualities of butter?—Water is a very essential element,

and it is chiefly necessary that it should be pure and free from objectionable matter. The variety, whether soft or hard, is not a matter of so much consequence as some seem to think; it is only important that it should be abundant and convenient. In regard to food the case is different. The condition of food affects the product of milk very much. Food intimately incorporated with water, like the succulent grasses, and every variety of succulent food, produces much more milk in proportion to the nutriment it contains, than food which is more matured and dryer.

Q. Have you any information as respects such conditions in the Dominion of Canada; that is to say, the suitability of Canada for dairying purposes?—Yes, I have travelled over considerable portions of Canada, especially of Ontario, and have been struck with the very favorable conditions existing in favor, not only for liberal, but very fine, dairy products. Your climate is severe, but there are circumstances which offset that. Your summer seasons are a little shorter that those further south, and your winters a little longer. It costs something more to protect cattle against cold, but you have an offset in the advantage of a continual run of feed during the summer. If we go, say into Southern Pennsylvania, or Southern Ohio, there is a very long period of dry weather between spring and fall. During that time, cows get dried down in the quantity of their milk from which they never recover. That long dry spell is a serious detriment in the way of our dairying and seriously interferes with the flow of milk. In Canada your summers are shorter, your seasons are moister, because you have frequent rains in summer which we do not have, and therefore you do not have the long period of drouth to interfere, and that, I have sometimes thought, more than offsets the longer season for grazing.

By Mr. Trow:

Q. You have had long experience in connection with the dairy industry?—Yes.

Q. You have in your work been in some measure identified with the industry in Canada?—Yes.

Q. How long an experience have you had in Canada?—Well, it is some ten or twelve years; I could not say positively without going back to some of the reports, but not less than ten years since I first became familiar with Canadian dairying. I have spent two seasons—1879 and 1882—in visiting factories to give instructions to manufacturers.

Q. With what part of Canada have you been principally connected?—Principally in Ontario.

Q. What was the state of the industry—of cheese and butter manufacturing—when you first visited this country?—It was quite different from what it is now. The products were vastly inferior to what they are at present, and are not as large.

Q. Has there been any considerable progress in Canada in dairying during these years?—Yes, Sir, it has been very great.

Q. Could you give us any statistics in reference to that?—No, I could not give you the precise statistics, but I remember that when I first became acquainted with Canadian dairying you were just beginning to export cheese in a very small way, and now the exportation amounts, if I remember right, to 58,000,000 lbs. with a value of between six and seven millions of dollars. And a short time previous to my acquaintance with Canadian dairying you were importing cheese from the United States.

Q. Can you inform the Committee as to the number of cheese factories in Ontario and Quebec and other Provinces, and what has been the increase during the year?—The number of factories in Ontario would probably run between six and seven hundred, and there are some three hundred more in other Provinces. The rate of increase is now probably about ten per cent. annually; in the earlier stages of development it was considerably greater.

Q. What suggestions have you to offer for the further improvement of the cheese industry?—I do not know that I could offer anything better than the course that is just now being adopted in Ontario. The method pursued there is to give personal instruction to the different cheese-makers in the factories. This is done under the aid of the Provincial Government. The Government has contributed money for

this purpose to the Dairymen's Associations in the Province, to be expended under their direction. They have employed instructors to go from factory to factory, and teach the art of manufacturing cheese, and, to some extent butter, but chiefly in the direction of cheese. The influence of this work has been very important, and so rapid has it been that it has made wonderful changes in the quality of the product within a few years.

Q. Why has the progress in cheese-making been greater than in butter-making? —That is on account of the introduction of the associated system—working together, from twenty to 100, and sometimes as high as 120, and even a higher number than that, of farmers, contribute their milk to one central factory, to be manufactured under the direction of one man. Now it is possible to find one man in a neighborhood who has very great skill in the manufacture of cheese or butter, but you could not find one in every family. This one man applies his skill to the milk of the whole neighborhood and consequently makes a very excellent article of a very much higher flavor and quality, and in that way the interest has been greatly advanced, the quality improved and the cost reduced.

Q. Can you form any estimates of the annual loss in the Dominion occasioned by a careless and indifferent system of butter-making?—I have occasionally figured up the loss in that respect for Canada, and I put it at $5,000,000 annually as the loss to producers.

By Mr. Cochrane:

Q. That is, a loss arising from deterioration in quality?—Yes; simply a loss in quality without any change in quantity.

By Mr. Trow:

Q. May the same or similar agencies, *i.e.*, the co-operative system, be expected to improve the butter industry as thoroughly and quickly as in the case of cheese-making? —I think not.

By Mr. Hesson:

Q. Can you give a reason?—The circumstances are different.

By Mr. Trow:

Q. Other things being equal, is it more profitable that milk be set for raising cream at home than cooled down and transported to a factory to be set there?—It is better; there are some advantages that cannot be had at a creamery that are obtained at the home farm.

By Mr. Cochrane:

Q. Could the milk be set at home and the cream taken and handled at the factory. That is, gathering the cream instead of gathering the milk?—That is done with very good effect under certain circumstances. In sparsely settled localities, especially in the west, that system is the principal one adopted. In the more thickly settled localities, where the milk is more convenient, the whole is transported to the factory.

Q. Does it injure the quality of the butter by carrying the milk, and do you get the same quantity of butter from the milk when thus carried?—There is not much difference. There is a little advantage in favor of setting it immediately at home, but the difference is not very large. The skill in handling the milk and manufacturing is such that they get about the same quantity at the creameries as they would at the farm with the same treatment.

By Mr. Trow:

Q. May we then look to the cream-gathering system to be the future system of butter making?—No, Sir, I think not. I have, perhaps, somewhat different views on that point from a good many of my butter-making friends. Butter made in creameries, whether the whole of the milk or only the cream is gathered, is not quite as fine as can be made at the home farm. The finest butter made, that I know of, is in the private dairies, and the circumstances are such that it can always be made there as soon as farmers can be educated up to a higher degree of skill. There is a possibility of having all the circumstances favorable at the farm which can hardly exist in a creamery; some will have poor milk, some will take poor care of the milk, and

some will feed badly, so that a bad flavor will be imparted to the milk, and all that goes in together to depreciate the general product. Whereas those circumstances can be eliminated in a small dairy, and the general result be much better.

By Mr. Homer :

Q. As an average would there not be better butter made by carrying the milk or cream to the factory than there is made at present as a general thing in private families?—At present the average of butter made at the factory is better than the average of butter made on farms, but the question I have answered implied possibilities in the future.

By Mr. Cochrane :

Q. You think it would be better to educate the people to make their butter on the present system at home than it would to try and introduce creameries?—Yes, that is my idea exactly. I think that is the direction in which both Canada and the States should labor, and I find that those who are best informed on this subject, in the States, are coming to the same conclusion. I foresee the time when the best, as well as the greatest quantity of butter will be made in the private dairies.

By Mr. Hesson :

Q. You have given us your private opinion ; what is the opinion of the people ?—Probably a majority are anticipating that the creamery is going to prevail.

By Mr. Trow :

Q. Are there any establishments to your knowledge in the Dominion where butterine or oleomargarine is manufactured?—There are none in the Dominion that I know of.

Q. Are there any in the United States?—There are quite a number in the United States.

Q. What effect may the manufacture of the artificial article have upon the production of the genuine article?—It would have no effect whatever upon the price of butter above the quality which it competes with. It has had none in the United States whatever. The best class of butter is quite as high, and indeed is a little higher than it was before the substitute for butter came into use. It competes with the lower class of butter, and reduces the price somewhat, but not very much. It takes the place, however, of an equal weight of butter manufactured from milk.

Q. Is legislation in this connection desirable, and if so what would you recommend?—My views are somewhat heterodox on that question ; that is, compared with the views of a great many of our people on the other side. I look at the matter in this light; the substitutes for butter are wholesome and fairly palatable, and as useful as butter from milk, and are therefore a legitimate product—their manufacture is quite as legitimate an industry as the manufacture of butter from milk. The introduction of these substitutes has on our side proved valuable to other farming interests, for all the substitutes are agricultural products. The better use that has been made of the tallow of beeves in consequence of these new products has advanced the price of beeves $5 per head, which is no inconsiderable item. To legislate against the conversion of the better portions of tallow into an article of human food instead of using them as a waste product, would be to legislate in favor of one branch of industry to the detriment of another, which, I hold, is not within the proper province of legislation.

Q. Is the Canadian cheese equal in quality to that of the American product, and how do they compare in price on the European market?—The circumstances in regard to that are a little peculiar and somewhat interesting. The Canadian product has been considerably inferior to the product of the States until within a few years. The improvements which have been introduced under the auspices of the Government, especially in Ontario, have advanced the quality of your cheese until now it is conceded that there is a larger proportion of fine cheese made in Canada than there is in the United States. I have within the last three weeks had occasion to speak on that subject with both Presidents of the Ontario Associations—Mr. Ballantyne, President of the Western Association, who is a large dealer in cheese, and Mr. Derbyshire, President of the Eastern Association, who is also a large cheese

dealer in the eastern portion of the Province—and they both agree in what has been my opinion before, that there is a larger percentage of fine cheese made in both those districts than there is on the other side. And perhaps on the average it sells a trifle higher, but our fancy cheese of the same grade as yours, sells higher in the States than yours does. You may wonder why this should occur, since the same market is open to both countries. It comes about in this way: We make five pounds of cheese per capita only, while you make from twelve to fifteen. We are a large cheese eating people, while you are not so much so; the consequence is, we eat two-thirds of the cheese we make, while you eat only one-eighth. In consequence of our larger consumption the best qualities of cheese are consumed by us at home. Our people will pay a higher price than the exporters can afford to pay for the finer grades of cheese. If the exporters would bid up on it, our people would bid up higher, and take it, because they feel able to eat the best cheese, and they pay a higher price than can be paid for export. You consume so little of your fine product that you are obliged to export it, and it does not fetch as much for export as ours does for home consumption.

By Mr. Kranz:

Q. The home market is always the best market?—Yes, Sir.

By the Chairman:

Q. I understood the question to apply to the relative prices of Canadian and American cheese in the European markets?—They are about the same.

By Mr. Cochrane:

Q. Then you think it advisable to educate the people of the country to consume the best quality of cheese instead of, as is very often done in the district I happen to live in, keeping the poorer cheese at home?—Yes. When our factories were first started, we consumed the poorer qualities and sold the finer goods. We were a little ahead of you in starting factories, and so our people now have got out of that habit, while you are just coming out of it. It is only a question of time when your consumption will be of the same character as ours.

By Mr. McNeill:

Q. Did I understand you to say that Canadian cheese is better than American cheese?—Your cheese has a larger percentage of fine quality than ours has.

Q. Is the best Canadian made cheese as good as the best American make?—Yes, Sir, quite as good.

Q. Is it better?—Well, in the competitions which have been held so far, you have come out ahead every time.

Q. How is it that we cannot sell our cheese in your market?—The tariff interferes; we protect our cheese.

By Mr. Trow:

Q. I notice by the statistics of Ontario, that Canada exported in 1858, 13,104 pounds of cheese, valued at $1,497; and in 1883, we exported 58,041,387 pounds, valued at $6,451,870. If the production of cheese increases for the next ten years as it has in the past, do you anticipate any danger of a depreciation in price in the English markets?—No, Sir. There is no danger of any sudden depreciation except for a very temporary period. The production of cheese will keep pace exactly with the demand and price as compared with other agricultural products. Whenever the price of cheese is such that farmers can make more at making cheese than they can at producing other agricultural products, they will follow it. The moment prices fall, from any cause, so low as to render production unprofitable, the poorer manufacturers will drop out, and the quantity will be decreased until the product assumes its proper value again. Neither in the United States nor Canada, will there be likely to be any one product that will run clear ahead of everything else to such an excess as to become valueless, so long as people can change from producing one article to producing another. It works so with us constantly and it will work so with you. So that the thing will regulate itself.

By Mr. Cochrane:

Q. What is the opinion now entertained as to the best food for cattle to use when grass is getting low, after the spring growth is over; between that and the fall growth. What kind of food is best?—There is a great variety of foods in use for that purpose. Perhaps there is nothing so generally used as what is called fodder corn.

Q. Has the general opinion settled down to that fact; that fodder corn is the best?—Yes; it is not the finest food, but it is the cheapest, because such an enormous growth can be produced on a given area of ground.

Q. Does it answer as well for butter as it does for cheese?—It is not quite as good for the flavor of butter as for cheese, but still it is very good.

Q. Well, is there any other food that answers better than corn for butter-making?—Yes, Sir, I think mixed peas and oats sown together, make better butter and of a finer flavor.

By Mr. Cockburn:

Q. Sometimes we find the milk turning bad; what is the cause of that? Is it diet?—In what respect?

Q. Sometimes in milch cows the milk turns unfit for use?—A multitude of causes may produce that. It may come from drinking stagnant water which is full of organic germs; they are taken into the cow's stomach and absorded into the circulation and go into the milk, still living, and develop in the milk and change the whole character of it very speedily. In another case, it might result from the dairyman driving his cows with a dog and heating them. In other instances it may happen from exposure to too much hot sun while grazing, and so through the list. There is a multitude of causes that may produce it.

Q. I have known it to occur in the winter time when the water was good?—It is then probably due to the character of the feed, perhaps to lobelia, rag weed, johnswart, or other medicinal weeds, mixed with their hay.

By Mr. Fairbanks:

Q. You speak of cows being exposed to too much sun while feeding; are we to infer from that that you recommend the preservation of a certain amount of shade in the pasture?—Certainly, that is an important item.

Q. You speak of feed to supplement the natural grass when it has become short, and you preferred peas or oats to corn?—Yes, for butter.

Q. I understand you to be speaking of feed cut before it is matured?—Yes, cut in its succulent stage; for what we understand by the technical phrase, "soiling."

By Mr. Cochrane:

Q. What opinion do you entertain in regard to feeding roots and their influence on the quality of the butter. Is there any difference as to the time in which they are fed—whether before or after milking—as affecting the flavor of the butter?—Yes Sir, it takes but a little while for the flavor which roots—and especially turnips—impart to the secretions to pass through and disappear. Flavors are taken up very quickly. I have known flavoring materials to be swallowed, and in fifteen minutes become distinctly apparent in the urine. It would become apparent about as quickly in the milk. It will appear distinctly in an hour, so that we know it is taken up immediately, as soon as it enters the stomach and as soon as the food can be dissolved, and it is soon disposed of. In the course of ten or twelve hours all the flavoring matter, which consists of volatile oils, is used up or excreted—it is mostly used up, I suppose, and produces animal heat. The oxidation of those volatile oils is very rapid and easy, and is nature's way of supplying animal heat; it is the rapidity with which they oxidise which enables them to be all used up in a few hours. So that if you were to feed three hours before you milk you would be likely to get a good dose of it in your milk. If you fed just after milking it would be gone by the next milking. It would be out of the way, if not fed in very large quantities at a time. If fed sparingly the flavor would be out of the way in twelve hours, or before milking again, but if fed too freely it would not be disposed of in twelve hours, and hence would appear in the milk.

By Mr. McNeill:

Q. Allow me just to ask another question. Do I understand you to say, that if you fed roots immediately before milking, it would in any way affect the milk?—It would be very likely to.

Q. What do you consider in the absence of roots is the best milking food for winter?—Well, probably well preserved ensilage is the best substitute, but then all roots do not have that effect.

Q. I am speaking of turnips now. Supposing you had neither roots nor turnips, what would be the best food for milking cows?—I think green food preserved in a silo would be the next best, but it must be well preserved. The skill necessary to preserve food in that way has not yet become sufficiently general to make the art of preserving food uniformly successful. About one half of those who undertake to preserve food in that way succeed, and the other half fail, and there is constant disappointment as to the value of ensilage as a winter food for cattle. Those who preserve it well, find it a very cheap and excellent food for producing milk, fed as a part of the diet. It will not do to feed ensilage wholly, any more than it would to feed roots wholly, for the reason that ensilage must necessarily be sour. To feed an excess of acid would injure the quality of the milk, while a small proportion of acid is not objectionable. A cow will digest it just as she will any other food—sugar for instance—but feed her more than she can digest and the excess will pass into the secretions, and the milk will take a portion of it to its injury. So that it is yet a question of skill whether ensilage can be successfully substituted for roots.

Q. In the section of country where I come from a good many of the farmers have neither ensilage nor roots, and they are not sufficiently advanced to go into raising roots largely yet. Now what would you consider the best substitute for winter feeding for milk cows where you have neither ensilage nor roots?—Early cut grass—clover hay—if it is well cured is the next best. On good soil two or three cuttings can be made in the season.

Q. With that, what kind of grain would you give them?—That would depend on what you had in purpose. I could not answer that without knowing just what you want to do.

Q. What kind of meal do you consider best for milch cows?—That depends on what product you want to obtain. If you desire to obtain cheese, there is nothing better than wheat bran. In fact it is one of the cheapest and most highly successful milking foods I have ever fed. If you are proposing to feed for butter it would not be as good as corn, or oat meal, mixed with linseed or cottonseed meal.

By Mr. Auger:

What is the difference between carrots and beets?—In what respect?

Q. To feed to cows in the fall and winter?—You refer to their nutritive value?

Q. Yes, and for butter?—The nutritive value of carrots is a little higher than that of beets, and the effect of the flavor is a little finer. You cannot raise quite as many carrots to the acre as you can of beets, and it costs more to raise them, so that farmers generally think it best to raise beets. The difference between a good crop of carrots and a good crop of beets is considerable; carrots will yield from 600 to 800 bushels per acre; and beets from 800 to 1,000 bushels per acre, the ground and culture being equal.

By Mr. Cochrane:

Q. When you speak of beets I suppose you refer to the variety commonly known as mangold wurtzel?—Yes.

By Mr. Homer:

Q. How would barley meal compare with oatmeal?—It makes very excellent milk, but it does not produce quite as fine a flavour as oats; the flavour is somewhat stronger.

By Mr. McNeill:

Q. Do you think there is any material difference in value for feeding purposes between the various kinds of mangold wurtzel?—No, I think not.

Q. And as to sugar beets ?—Mangolds are not materially different from sugar beets. They are not quite as rich, and contain a little more woody fibre. They are not quite as nutritious by the pound, but the larger yield per acre makes them more valuable than the smaller kind.

By Mr. Trow :

Q. You spoke of the fact that more cheese is consumed in the United States, in proportion to population, than in Canada. Are you aware that many people complain that cheese does not agree with them, and that is considered by some as indigestible ? What is your opinion about this and as to the nutritious value of cheese as an article of food ?—Both objections lie against cheese to some extent, as it has been the custom to make it in factories, but neither indigestibility nor unwholesomeness is a necessary characteristic of cheese as such. Its quality as food is varied by circumstances of manufacture and curing. The conversion of milk into cheese is a digestive process induced by the action of rennet, and is strikingly analagous to the digestion of milk in the living stomach; but in cheese-making the work goes on very much slower. The action of gastric juice upon the protsin compounds of milk—albumen and casein—is peculiar and interesting. It is not the same upon both of them. The albumen exists in milk as a perfect liquid. It is so perfectly hydrated, *i.e.*, so chemically combined with water, that it can be, and is, readily absorbed into the circulation without change. Gastric juice does not in any way materially alter it. With casein, the basis of cheese, the situation is different. It is now believed to be a semi-solid, or viscous liquid, somewhat resembling a thin solution of glue, or like the fluids in blood. If it was a perfect fluid like albumen, and remained so when taken into the stomach, it would in like manner be at once absorbed without change. But as it exists in milk it is only a semi-liquid, being only imperfectly hydrated. By reason of this different condition rennet acts upon it. Whether unfortunately or otherwise, as soon as it comes in contact with gastric juice it coagulates and forms a curd insoluble in water and other neutral liquids, but is readily soluble in alkaline liquids, and is slowly soluble in gastric juice. Its conversion into curd greatly retards its digestion. Its congener and associate, albumen, which it closely resembles, but which is not coagulated by stomach juice, retains its liquid form in the stomach and is at once taken into the circulation and is out of the way and in process of assimilation, long before the stubborn coagulum of casein begins to yield to the slow action of gastric influence. So in cheese-making, the conversion of milk into curd seems unfavorable to immediate digestion, and the treatment which next follows tends to increase the difficulty. The first thing we do in making cheese is to convert the casein of the milk into an insoluble and almost indigestible curd. The next step is to deprive it of twenty-nine thirtieths of its water, making it still harder and more indigestible, and finally we solidify it still further by adding salt, and thus by the time it is out of the press we have put it into an indigestible condition and rendered it unfit for human food until modified by further change. This we affect by waiting for the slow action of rennet and the free oxygen of the air to break down the tough, elastic and insoluble compound into a tender, plastic, soluble cheese—a cured cheese—ripe and rich, with a new flavor and digestible, and wholesome, and nutritious.

In such a condition, cheese is in its best estate. It is then easily and fully digested and every particle of it is utilised as food. Cheese when properly made and thus thoroughly cured, has twice the value of butcher's meat for sustaining life, and is quite as easily digested and as wholesome. But all cheese is not equal to its highest possibility. Various circumstances interfere with its perfection. In the first place good cheese can only be made out of good milk, and this is not always at the control of the cheese-maker. Then milk which was good when it came from the cow may not be so when it reaches the cheese vat—it may be sour, or stale, or uncleanly. And further, milk itself is a very complex and unstable compound, always varying in the quality and proportion of its constituents, and thereby modifying the products made from it. Add to such irregularities unskilful manufacture and curing, and some imperfections may reasonably be expected.

When the milk and manufacture are right, the state of curing may have very much to do with its food value. I have already referred to the fact that curd and green cheese are very nearly indigestible, and that digestibility increases as the curdy state disappears and the cured state advances. Much of the cheese of commerce when it goes into the market and into consumption is too little removed from its curdy condition to be fully available for human food. One reason for its going into consumption too soon is, that if fairly made, it acquires an agreeable flavor before the curing is much advanced. Then a desire to save shrinkage, and labor in caring for it, as to realise on it as soon as possible, all conspire to hurry it off while green. And finally, there is considerable hot weather cheese, which, from faults in making and the use of bad rennet, that must be disposed of before cured, or it would spoil on the makers' hands. All these cases operating together, with a total ignorance on the part of makers, merchants and consumers, as to the actual state of things, tend to push cheese into the market when it is so little cured that only about half of it can be digested, and hence the complaint of indigestibility and unwholesomeness.

Another cause of depreciation resulting from defects in manufacture, comes from the manner of employing acidity while manipulating the curds. The defect alluded to is the practice of leaving curd in the whey after the whey becomes sour. This practice, which has been so generally followed for the purpose of hardening the curd, and making solid and firm cheese, has not been without some compensating effects, but the injury it has done far outweighs the good. There are three classes of elements in the food of animals, each of which is equally essential to the maintenance of life and health. They are the carbhydrates, which develop fat and animal heat, such as sugar, starch, gum, dextrine, cellulose and animal and vegetable fats—albuminoids, which build up flesh and tissue, such as the solid matter in cheese or casein, animal flesh and tissue—the white of eggs and the gluten in wheat—and, third, the mineral elements which go to build up the bony structure and teeth and serve other purposes in the animal economy, such as potash, soda, lime, iron, and other mineral matters, including phosphorus, which exist in the form of phosphates. Each of these three kinds of matter is equally important and indispensable. These all exist in milk in just the right proportion to sustain life and health, and this is what makes milk the perfect food it is. Take out either one of these kinds of matter and the young animal for whose nourishment milk was designed, would soon sicken and die, and the adult living upon it would soon tire of its use and fail in health. The practice of soaking curd in whey till the latter becomes sour, injures the food value of cheese by dissolving out of the curd the mineral matter the milk contained, thereby changing, in a very marked degree, the character of the resulting cheese, and rendering it an imperfect and unhealthy food. A little explanation will make this point clear. The mineral elements of milk constitute its ash. They consist mostly of phosphates, as the phosphate of lime, of soda, potash, iron and magnesia. About one-half of milk ash is phosphate of lime, which consists of phosphoric acid and lime. This compound is easily dissolved, for lime has only a feeble affinity for phosphoric acid. When in contact with a liquid acid for which it has a stronger affinity than for phosphoric acid, the lime lets go of the phosphoric and combines with the stronger acid, forming a new compound and leaving the weaker acid free. Lime has a stronger attraction for lactic or milk acid than it has for phosphoric acid, and when the curd containing phosphate of lime is immersed in sour whey, the lime lets go of the phosphoric acid and combines with the lactic acid, forming lactate of lime, which is insoluble and useless, leaving the phosphoric acid in solution to be carried off in the whey.

Leaving curd in sour whey the length of time customary in the so-called acid process of cheese-making, I have found by testing, carries off in the whey one third of the mineral matter of the milk, which so far destroys the balance of elements in the cheese as to make it an unwholesome food, and this is one of the prominent reasons why people so easily tire of cheese, as we have been in the habit of making it, and why so many people object to it on the score of health. This practice of steeping curd in sour whey further depreciates the food value of cheese in another

way. The loss of mineral matter, it has been proved, impairs the solubility and digestibility both of the curd and cheese, causing a large loss of the solid matter of cheese from imperfect digestion. The loss from this cause in the food value of cheese is simply immense. Thus the practice works injury in two directions. First, the loss of a large part of the mineral elements in milk so impairs the digestibility of cheese that the average human stomach is unable to cope with it, and much of what might otherwise have been valuable nutriment is passed indigested and lost to the consumer. Second, by tendency to unhealthfulness from its imperfect character as a nutrient by reason of the loss of the necessary mineral element. This loss so impairs the composition of cheese as to compel a very limited use of it by most people. It is rare indeed that any one can partake at all freely of such cheese without soon suffering from its notorious tendency to constipation and a general disturbance of the whole system. These effects are so uniform and frequent that people very naturally suspect they are the legitimate consequence of eating any cheese. This, however, is not so. It is only the effect of imperfect manufacture and curing. When properly made and cured, cheese is as healthful as other human food, and can be freely used by the average citizen, and even by invalids, with impunity; and so far from having any constipating tendency is rather a laxative.

With these facts staring everybody in the face, who will take the trouble to look at them, it cannot be thought extravagant to say that the great bulk of factory cheese goes into consumption in such a condition as to make it unhealthful and not more than half utilized.

The public judgment rates cheese at half its possible value. The average price of cheese is not above that of butchers' meat, if it will run as high. Perfect cheese having twice the life-sustaining power of an equal weight of meat, it ought, if it was all perfect, to sell for twice as much. The fact that when used as an article of necessity it brings no more than meat, is evidence that the public, from its practical use, judge it to have no greater value than meat, which is placing it at half its possible value. It has often been observed by those who have kept a close run of the cheese market that it competes with meat and the price runs up and down with certain classes of animal food.

I have made a great many tests of the digestibility of cheese by the use of pepsin, and for average cheese they correspondent very closely with the public judgment of its value as above shown. They have also shewn that when curds have been taken out of the whey before the latter is sour, and afterwards well ripened before pressing, and in other respects properly made and the curing well matured, every particle of the cheese was perfectly digested, and it was, without objection, on the score of health. From this high standard, digestibility ran all the way down to fifteen per cent. of its possible value, just according as it was imperfectly made and cured. It is gratifying that improvements in the cheese industry are rapidly progressing, but there is evidently still a wide field open for missionary work both by the Government and private enterprise.

Q. Do you approve of coloring cheese, and how do you account for the English giving preference to colored cheese?—I do not approve of colouring cheese. It injures the quality of the cheese by introducing an alkali which tends to dissolve the cheese and destroy the gastric agency. Alkalies kill the force of the rennet. Alkalies are always introduced in cheese with coloring. You cannot distribute coloring matter without cutting it with alkali; there is no other way known to dairymen. The reason that it is preferred in the English market is beyond my comprehension. It is so perfectly ridiculous that I do not know how any sensible people could ever call for it.

Q. You are aware that it is the case?—Yes, I am aware that such is the case, but people are now getting to understand the use of coloring matter, and it is rapidly abating.

By Mr. Kranz:

Q. Do you suppose if the people knew how the coloring is made they would abstain from it?—Certainly they would.

Q. And manufacturers keep it a secret?—They do not attempt to keep it a secret, but the consumers do not interest themselves enough to find it out.

Q. It might be just as well for you to state how coloring is manufactured?—It is simply an extract of annatto, tumeric, or some simple coloring matter dissolved in alkali. Potash is the usual agent; sometimes sal-soda is added, but potash is all that is necessary.

Q. Is not colored cheese supposed to be richer in quality than white cheese?—Some people suppose so, but it is exactly the reverse. The cheese is slightly richer if it is not colored.

By Mr. Farrow:

Q. Will you give us your opinion about the coloring used in butter?—The coloring matter in butter is now entirely unobjectionable. Formerly it was as bad as that used in cheese. This prepared coloring matter is taken up in a pure oderless oil, and in this way it does no harm. Butter is not injured by the present method of coloring.

By Mr. Cochrane:

Q. What is the name of the process which you employ in making cheese when you take the curd out before the whey is sour? Is it the Cheddar system?—It is not necessarily the Cheddar system, but the Cheddar system proper may be followed after drawing the whey or it may not. It is known as the sweet curd process, because the curd is got out of the whey while it is sweet. In the Cheddar process the curd is generally taken out after the whey is sour, but sometimes it is taken out before.

Q. When the curd is taken out of the whey before it is sour don't we leave it in the vat and cover it up until it is sour?—Yes, but when there is no whey draining away from it the mineral matter is not lost. It remains there and the phosphoric acid which is liberated and becomes soluble reverts just as it does with superphosphates. It is exactly the same change which it goes through as in the manufacture and preservation of superphosphates. You know that superphosphates if kept until they are quite old, lose some of their value. They lose on account of phosphoric acid which reverts and combines with the lime. This is the same in cheese; it combines again with the lime, and forms phosphate of lime. So that the souring stage of cheese, after the whey is taken out, is not objectionable.

Q. What about the notion that it takes more milk to make a pound of cheese by your process than in the old process?—It does not take quite as much. The loss of the mineral matter by the other way makes quite a difference, and the flavoring oils are all preserved.

By Mr. Trow:

Q. At how low a price per pound do you consider cheese can be manufactured more profitably than grain can be grown at ordinary prices?—Well, without stopping to make a definite calculation I think it could be manufactured at eight cents per pound, and be as profitable as raising grain. It would be better for the farmer to make cheese at eight cents per pound than to raise wheat at ordinary prices. Perhaps it would pay to go still lower; as low as six or seven cents per pound.

Q. And indirectly the farm is enriched at the same time?—Yes, a pound of cheese does not cost the farmer to produce above five cents. Farmers of course cannot afford to sell their produce at bare cost any more than other people. They must make something besides cost or they would be obliged to live on their labour only.

By Mr. Cochrane:

Q. In that calculation I suppose you take into consideration the exhaustion of the soil?—Yes, that is certainly an important item, but if it were a mere matter of income, I think cheese at eight cents would be more profitable than grain.

By Mr. Coughlin:

Q. How does raising cheese compare with beef at present prices?—You can raise a pound of cheese for about half as much as a pound of beef, because the same food that will produce a pound of beef will produce two pounds of cheese, and you can get at the comparative profits through such a channel.

By Mr. Cameron (Middlesex):

Q. What is the comparative drain on the farm in raising cheese and grain?—Oh, it is very much greater with grain. The loss in making cheese is very little; it is only the loss of a few cents per acre. Forty pounds of bone earth sown upon the pasture for each cow, would keep the land good forever. Apply to the farm forty pounds of bone meal for each cow annually, and you can keep up the fertility of the soil indefinitely.

By Mr. McNeill:

Q. What is the average price of bone earth?—About $20 to $30 per ton.

By Mr. Trow:

Q. In this connection do you not think it advisable that farmers in the older Provinces, where lands are impoverished by continual cropping, should turn their attention more to the manufacture of butter and cheese?—That has been my opinion emphatically.

By the Chairman:

Q. Does not the manufacture of cheese to some extent interfere with raising stock. Calves are not raised to so great an extent where the milk is sent to the cheese factory?—Well, perhaps they are not quite as apt to raise their calves under the cheese system as otherwise, from an idea that the refuse from cheese is not so good for calves. But farmers are fast finding out that they can raise calves very successfully under this system too.

By Mr. Kranz.

Q. You stated that the loss to Canada was between $4,000,000 and $5,000,000 in the depreciation of value in butter owing to bad manufacture. Do you not think that the way butter is marketed in Canada has a great deal to do with its poor quality and consequent loss to the country?—No doubt it has to a very considerable extent.

Q. Nine-tenths of all the butter in Canada is collected by the country store-keepers and is repacked by them, with little regard to quality or cleanliness?—It is a very bad way.

By Mr. Trow:

Q. What breeds of cows are considered the most profitable for general dairy purposes?—There is a very great difference in opinion on that subject. If you desire my opinion I will give it; I think the best cows for general dairy purposes are the common cows of the country. And if you wish my reasons for that, I can give them. The average farmer has a certain amount of skill in the management of stock: His skill is not sufficient to take care of the thoroughbred Shorthorns. If you put them into his hands, they will deteriorate in a very short time to the condition of common stock. The extraordinary quality of beef-producing which has been acquired by the Shorthorn breed, for example, is artificial; that is, it is an acquired characteristic, and is easily lost. If the circumstances which have produced it are not kept up, it will not be sustained. You withdraw the course of treatment which has developed the result, and the breed will fall back in a short time to its normal standing. This tendency of the Shorthorn breed to revert back in a few generations to its old condition, is also true of any other breeds. Take the Jerseys which have acquired an extraordinary capacity for secreting fat in their milk under the exceptional conditions to which that breed has been subjected through a long course of careful selection in breeding, and with the best of attention and care in feeding, and that capacity will continue. But put a cow of this kind into the hands of the average farmer, and she will soon run back to the condition of an ordinary cow. They come down to the level of the farmer's mode of treatment, and they cannot rise above it. If our average farmer would treat the common cattle better they would improve at once. There is good blood enough in the common stock of the country, and many of them make excellent cattle. They furnish the best general cows in the world if they are only properly developed by feeding liberally and by proper selection in breeding, but as the average farmer takes care of his cattle, they are as good as the harsh treatment and scanty fare which they receive will sustain, and it is no use to put

anything else into his hands because it would in a very short period retrograde. There have been Shorthorns enough introduced into Canada and the United States to have changed the cattle all over the country, if that blood had been sustained, but they have had to submit to rugged fare and exposure, and they have run back to the level of ordinary stock.

By Mr. Hesson :

Q. Is it not a fact that Jersey cows are very easily fed and kept ?—They are just the same as other stock that has been bred and developed to an extraordinary degree. If the favourable conditions are not continued they will soon run back.

By Mr. Farrow :

Q. Do you not think that the ordinary cows throughout Ontario, have during the past few years, given a larger quantity of milk than formerly ?—I certainly think they have, and the same is true with regard to cows on the other side.

By Mr. Cochrane :

Q. If forty lbs. of bone meal per cow, will supply the constituents taken from the soil by pasturage each year, is it not a fact that the older the pasture becomes—the longer it remains in pasture without being broken up—the more nutritious is the feed ?—As a general rule that a greater variety of grasses work in, the older a pasture becomes, and where it is sustained it becomes very rich.

By Mr. Cameron (Middlesex) :

Q. What is the best time to apply these fertilizers ?—It is not material, because the process of incorporation into the soil is slow, and it makes no difference what time it is applied. There is no danger of its being wasted by exposure.

By Mr. Springer :

Q. You refer to pure bone meal ?—Yes.

By Mr. Fairbank :

Q. Would you apply it on the green sod ?—Yes, as soon as any other way.

By Mr. Allen :

Q. What is the relative cost of butter and cheese to the farmer to produce ?—Taking it as an average, butter costs perhaps a trifle more than double what it costs to produce cheese by the pound.

By Mr. Cameron (Middlesex) ·

Q. Well then, at that rate butter costs about the same as beef per pound ?—Just about the same. Professor Brown stated at the Eastern Dairymen Asssociation meeting, a few days ago, that he had been making experiments to ascertain the cost of producing beef and butter, and his conclusion was that the food which produced a pound of beef would produce a pound of butter. That has been my conviction from general observation for a great while.

Q. Then the difference between the average price of butter and the average price of beef, is not profit wholly ; it is only the cost of producing that we have been considering ?—Yes, the cost of production.

Q. Or rather the food used in producing ?—Yes ; it is the food that costs the same ; as the same food that produces a pound of beef, will produce a pound of butter.

Q. But the difference in the price between the two products is not profit ?—Why not ?

Q. I am putting it as a question, because I am assuming that there must be other influences ?—Yes.

By the Chairman :

Q. If the same quantity of food that will produce a pound of beef will produce a pound of butter, the cost of manufacturing the butter may be an element ?—Yes, but the refuse from this milk would be sufficient to meet that, so that the difference in price if any, is the difference in profit. Perhaps it ought to be a little more than that, because when you produce your beef and kill it there is an end of it, but you have the cow in the case of the butter, alive and ready to give you the same return again, which should be regarded as a further profit.

By Mr. Watson:

Q. You do not appear to approve of thoroughbred stock, as a rule, for dairy purposes. What grades do you think are the hardiest and best for the dairy?—That depends on what you are going to produce; that is, what kind of dairy produce.

Q. Well, say butter or cheese?—Which is it—butter or cheese?

Q. Well, say both?—Perhaps the grades of the shorthorns would, under all conditions, be the best—that is graded on the native stock. But let me remark in connection with this gentleman's observation about my not approving of thoroughbred stock, that I do approve of it. I go for thoroughbred stock for a thoroughbred man.

By the Chairman:

Q. Did I understand you to say that the development of fat was a characteristic of the Jersey breed?—I referred to the power of secreting fat in the milk.

By Mr. Hesson:

Q. In regard to Jerseys, are they not more easily kept than other breeds?—They are about the same as other cattle; there is no material difference.

Q. Do I understand you to mean by that, that there is no material difference between Jerseys and other breeds as to the cost of keeping in good condition, or as to their ability to subsist under ordinary farmer's care?—There is so little difference in the value of any one breed over another for the farmer's purpose, that I cannot single out any one in particular. If there was any marked difference, that would soon be settled, and the breed which was entitled to the balance of favour would go ahead of all the others, but it is constantly an open question, and a matter for individual preference.

Q. I thought it had been laid down pretty clearly in the report of the Committee appointed by the Ontario Government some time ago, that as between the Shorthorn and the Hereford breeds, there was no doubt whatever that under ordinary treatment the Hereford would keep better and return a greater profit than the Shorthorn?—But the Shorthorn people do not admit that.

Q. Is it not a fact that a higher price is obtained for both butter and cheese produced from Jerseys, than from any other stock?—Probably it is true with regard to butter. It is not so well settled in regard to cheese.

By Mr. Ferguson (Leeds):

Q. Is not this the result of fancy more than anything else up to the present?—Well, perhaps fancy may have something to do with it.

By Mr. Trow:

Q. What in your opinion are the chief points to be noted in the selection of a good milking cow?—You mean externally?

Q. Yes.—Well, I will tell you how I select a cow. The first thing I do when I look at a cow is to take a side view to see her general shape. She should be a little smaller forward than behind. The first organ I estimate is her stomach. If she has a large, capacious stomach, and the colour or complexion of her hair is good, showing vigour as well as a large stomach, I conclude she has something that will answer to a good large boiler for making steam—she is able to eat and convert, or digest, a large quanity of food. That is the first essential; since we cannot get something from nothing we want that something to be as large as possible to make it from. Then I look at her milk producing apparatus. I go behind her and see that she is well spread, seeing that the blood vessels and organs which are located between the hips have plenty of room and that she has that large organic structure which spreads the hips apart. Then I take a look at the peculiar shape of the udder. I see that it is well developed forward, that the teats are far apart and wide between each other, and that they do not collapse. This shows that there is a large udder. Finally, I take a look at her escutcheon, which is the name given to the upturned hair on both sides of her bag, because from that I understand, by an arbitratory rule, the reason for which I cannot give you, that a very correct estimate can be made of the milking capacity of the animal. Then I look at the milk veins on her abdomen to see that they are large because then I

know that a large quantity of blood is being conveyed to the udder, and from this the cow is capable of producing a large quantity of milk. If they are small, I know that little milk passes through the udder, and consequently she can manufacture little. I see whether or not the veins are so small as to hinder the flow of blood in its passage out of the udder, for it is blood that makes milk. That is the way I estimate a cow.

By Mr. Trow:

Q. What should be the average yield of milk per cow, if properly fed?—You mean an average cow?

Q. Yes, the yield per day from an average cow?—That will depend, of course, on what part of the season you make the estimate.

Q. What should be the yield per annum?—A cow should yield, on an average, about 5,000 lbs. of milk during the year. It is not profitable to keep a cow that would give much less than that.

By the Chairman:

Q. That would produce about 500 lbs. of cheese?—Yes.

By Mr. Cochrane:

Q. Could you put it on an average daily yield for different periods of the year?—It would be very difficult to make a calculation of that kind.

By Mr. Fairbank:

Q. You have spoken of the care and feed of animals—of proper water, and the most favourable circumstances under which a cow can be placed—which I understand to be the basis of success. You are aware that in many instances it is considered adequate to drive a cow once or twice in the twenty-four hours to a mud hole for drink. Does that furnish ample water for a cow, or is it what you would consider placing the cow under favourable circumstsnces?—Water should be very convenient. If a cow is to keep up a large flow of milk she wants to have a good supply of pure water always at hand, and unless that is the case, her milk not only falls short in quantity, but it fails in quality. The quality becomes immediately altered by the falling off in the water supply, and I will illustrate that point by giving you a fact in my own experience. In my dairying I have water running through the centre of my pasture, and the cows can get it any time they choose. On one occasion I was weighing my milk and noting the product which I obtained, and from a certain amount of milk I ascertained that I could get 100 lbs. of cheese. There came on a dry spell, which lasted so long that the stream in my pasture dried up, and all at once my cows had to go 30 or 40 rods down a steep incline to a brook outside of the pasture to get drink, and they would only go there once a day. They got all the water they wanted once a day, and they would not go any oftener. The result was that my cheese fell off immediately 7 per cent. in quantity, and 2 per cent. in quality; so that I got only ninety-one pounds of cheese where before I got 100 lbs.

By Mr. Allison (Hants):

Q. Might not the dry weather have affected the feed as well as the water, and in that way have contributed to the falling off in the product?—This was done in a day The feed was not materially altered in that time, and just as soon as they got water where they could have it at will, the cheese product came up to 100 lbs. again.

By Mr. Cochrane:

Q. Then, in your opinion, it would be well where cattle are watered from the pump, that instead of having it given to them once or twice a day the water should be pumped into a tank, so that there would be a supply for them whenever they chose to come for it?—Yes; they should have it whenever they want it.

By Mr. Cockburn:

Q. You said it made very little difference whether the water is hard or soft, so long as it is pure?—No material difference.

Q. What would you think, then, of grass growing in a country of limestone formation as compared with that on soil which is exclusively granite and gneiss? Is there any difference in the quality of the milk?—Yes; there would be, but I never

saw a country that was wholly destitute of lime in the soil. Where the soil is made up largely of minute pieces of granite scatttered through it, they dissolve very slowly and do not furnish a quick supply of plant food, but with lime it is different.

Q. A large portion of the northern and central part of Ontario is on a limestone formation?—I have found the best milk I found anywhere in Ontario, 100 miles or more north of the Lake, clear away in the extreme settlements.

By Mr. McCraney:

Q. What is your opinion as to the value of the product from a cow made into cheese for the year, or for the season, compared with the value of the same product used in making butter and raising a calf?—Those things regulate themselves entirely by the laws of supply and demand. Whenever the price of one class of produce is elevated, of course that product becomes a most valuable one. When lack of supply elevates the other kind of product, that will be the most valuable in its turn. It is a thing which is all the time oscillating one way or the other.

By Mr. Watson:

Q. I suppose you have not been in the North-West?—Not in your North-West.

Q. Supposing you were going to the North-West, how would you conduct your dairy? Would you go into butter making or cheese making? Which would you consider the most profitable?—I do not think there would be any difference; I think one would be about as profitable as the other. If I were going there I should do a little differently from what most people do in making butter and cheese. Most people have an idea about butter, that whatever of the milk remains is valueless, but I differ very materially from them on that subject. The best part of the milk is still left after the butter is out; the nitrogenous portion, that which builds up the bone and structure of the body is still there and forms a valuable animal food. You can make more money out of milk by making a considerable proportion of the best of the milk into butter, because then you have a superior article of butter, as the cream which rises first is a good deal better than that which rises last, and the milk which is left makes an excellent article of skim cheese, which may be a valuable, nutritious and wholesome food, if well manufactured. The two together will bring more money than either of them alone.

By Mr. Fairbank:

Q. Is there a difference in the value of milk manufactured in the dairy, or the residue of it?—Yes; the refuse of the milk from the butter dairy is worth a great deal more than that from cheese.

Q. Particularly for raising calves?—Yes; and for other purposes.

By Mr. Fisher:

Q. Do you think making butter and skim cheese is more profitable than retaining the milk for raising calves and pigs?—Yes, if it is properly manufactured.

By Mr. Trow:

Q. What should be an average yield of butter from 100lbs., or about ten gallons Imperial measure, of milk?—It ought to be five pounds. It is not quite four pounds on the average. It takes about twenty-six pounds of milk on an average to make one pound of butter, taking the country as a whole. One hundred pounds of milk should make five pounds of butter.

Q. How many years should a good dairy cow, if properly cared for, and well fed, milk with profit?—If no other use is to be made of her than butter making, she can be milked ten years, but it is not profitable to milk a cow so long. It is better to turn her to beef at an earlier stage and replace her with a younger cow. Perhaps five or six years is as long as a cow ought to be milked for profit, if you are going to use her for beef, and it is more profitable to do so.

By Mr. Allen:

Q. What is the proper degree of heat at which milk should be kept from the time it is milked until it is churned, and what is the best means adopted for keeping milk at the right temperature?—Well, there are so many considerations connected with that question, that it would be impossible to give a specific answer. There is no one temperature which is better than every other temperature under all circumstances.

it depends upon what you propose to do. For instance, butter of the most fancy grade is made by setting the milk open to the air, and pretty well spread at a temperature of about sixty degrees, but if you are making butter for profit, that is, to get along with the least labour, it is better to refrigerate to forty-five degrees, and reduce the temperature, as the cream rises best while the temperature is falling. You set it as warm as you can, and cool it down as low as you can, and thus you get the cream quickly and you save a great deal of expense while you make a more thorough separation than you would in the other way, but in this method you will not have quite as fine a quality of butter. The butter will keep a little longer if made the other way, and people will pay a somewhat fancy price for it, but in the ordinary way it keeps quite long enough for all practical purposes. So that it is a question what you are going to do with the product, what temperature you should assume. Generally, the cold system is thought to be the most practicable, because you get the largest amount of butter with the least amount of labour, and more money is made in this way by the great majority than would be made from the fancier product.

Q. Would the flavour be as good by the cold system?—It is not quite as fine by this system as where it is exposed to the air.

Q. Then, as to the salt required for saving it: is American and Canadian salt equal to Liverpool salt for this purpose?—When it is purified it is quite as good. There is no necessity for importing salt from another country for making butter or cheese.

By Mr. Trow:

Q. What effect has the overworking or kneading of butter to remove the buttermilk on the quality of the product?—In the matter of butter-working each housekeeper has her own peculiar method. Many consider that the process of kneading has a tendency to work out the buttermilk, and that it will make a better quality of butter, and it is the system which is generally adopted by housekeepers. To my mind that system is very unphilosophical and very unfortunate. Butter is made up of fatty globules. They are of very minute texture, but still each has a distinct organism. The globule is like an egg, composed of one kind of fat in the interior, with another kind lying next to that, and so on until you come to the outside. The fats appear to be definitely arranged, and if you preserve their structures without breaking up the globules you have finest quality of butter and the best keeping butter, and dairymen now labour with a great deal of pains to endeavour not to break up those globules, or as they call it, destroy the "grain" of the butter. To break up the globules has the same effect upon the preservation of the butter as to break up the interior of an egg would have in the preservation of the egg, and it alters the flavour. The flavouring oils seem to be mostly upon the exterior, and if you keep the grain perfectly sound you get that flavour in the taste of the butter, which you do not when you break the globule and distribute its contents. The consequence is, that dairymen now hardly work their butter at all. They consider the less working they can do the better. They churn the cream to a certain degree, until the butter begins to come in granules the size of a kernel of wheat, or of peas, and then they draw off the buttermilk and rinse the butter until all foreign particles are removed. If it is then carefully worked, with a view to preserving the grain of the butter, you will get an article in its purest state, and capable of keeping for an almost indefinite length of time. I have known butter to keep for three years in a closely covered crock, and that butter, when I tasted it, was just as free from rancidity as when it was first put down. It had acquired an intense flavour but it was not in the least rancid

By Mr. Ferguson:

Q. Your opinion is that there is more butter spoiled in this country by excessive ladling than by long keeping?—Yes; there is no necessity for butter turning rancid so soon as it does, if it is properly made. It can be made so that it will keep almost indefinitely, but if in working it is hammered and pounded, its flavour is altered and its colour also, and it is undesirable for food.

By Mr. Cochrane:

Q. If it is not worked so much, you think there would not be so much danger of breaking the globules as there is by the pressure which is exerted in working with the ladle. I have seen butter which looked almost as if it had been pounded in a mortar?—It is better to press the buttermilk out than it is to work it out by any sliding or grinding process, because the sliding friction breaks the grain.

By Mr. Hesson:

Q. What you want is to get the buttermilk entirely out?—Yes; to get it all out.

By Mr. Trow;

Q. Could you not more successfully get it out by using a sponge or a cloth than by hammering?—That would operate on the outside of the mass but it would not remove the buttermilk from the inside.

By Mr. Cameron (Middlesex):

Q. What machinery is necessary to change to the system you have described to us? I suppose there is some particular machinery manufactured for the purpose?—Yes; and there is a gentleman in the room who has a very nice set of machinery for doing this work that I have described, and he manufactures it for sale. It is a very good apparatus, and I hope to see it generally introduced.

Q. Is the machinery of that character that every farmer who makes a reasonable quantity of butter can afford to introduce it?—It is perfectly simple.

Q. And cheap?—Yes; quite cheap.

By Mr. Allen:

Q. In packing butter what is the best kind of wood to use for packages?—White oak.

Q. Is it better than ash?—Yes; it has less flavour. Spruce and hemlock are also good.

By Mr. Hesson:

Q. Is that machinery you have referred to patented?—I do not know; I have never inquired whether it is or not. Mr. Lynch, the manufacturer, is here, and I will refer you to him. I have seen no machine that I like better.

By Mr. Cameron (Middlesex):

Q. I understand you to say that in getting the buttermilk from the butter it is necessary to do it without breaking up the fat globules. Could not that be best done by drawing off the buttermilk and washing out the butter while it is yet in the churn, and would not any churn in which you could affect this, be suitable for all purposes?—It makes quite a difference in quantity and quality of butter what the mode of churning has been. If you take a churn, for instance, of the class known as the crank churn, which are very plentiful through the country, you find that they consist of a half round box with a tight cover, and that the churning is done by a shaft which runs through the machine, on which are a number of paddles or arms, which revolve through the cream. In that kind of churn, there is not an impartial friction. That float, or whatever you call it, passes through the cream and only comes in contact with a portion of the cream at a time. It operates from an angle, and it does it all by friction, and the result is that it works out a portion of the globules while a portion remain unchurned. You want a churn that will operate upon all the cream at the same instant and upon all alike, and then it will all come at once.

Q. Is not the dash churn the same in its action as the crank churn?—That depends upon how it is made. If the dasher is so constructed that it will cut through the cream and produce an equal pressure on the whole surface at the same time—that is, make a yielding pressure, it will churn it all alike. Many dash churns are not so constructed.

Q. What do you think of a spring churn, which oscillates from one side to the other by the action of a spring?—That is a very good way, and another way which is very good is to rotate the cream in a square box or barrel, endwise. In that way you cut through the whole of the cream, and it falls with a thud on the other side, and the force thus operated upon it will bring the butter very efficiently. You operate upon all the cream at the same time, and the whole comes at once. But if

you were to to take barrel and rotate it the other way, the sliding or grinding friction thus produced would not be as good.

By Mr. Bourbeau:

Q. To whom are we to apply for those improved machines you have spoken of?—To Mr. Lynch, who is present in the room.

By Mr. Cochrane:

Q. What is your opinion with reference to drawing milk to the cheese factory once a day or twice a day?—It is just as well, and a little better, to draw but once a day where the milk is properly cared for.

Q. Where you have a creamery and are drawing your milk, is it just as well to draw once a day as twice a day?—No, sir; the case is different. The cream will separate from the milk in a short time, and if you draw it but once a day you will have the cream partially churned in the night's milk, and not churned in the morning's milk. In this way, you will churn unequally, and you will not get all the butter from the milk.

Q. Then, where there is a creamery you would draw twice a day?—Yes, sir.

Q. And to a cheese factory but once a day?—Yes, sir.

By Mr. Ferguson:

Q. Is there any particular breed or grade of cattle which has been discovered or proven to be better in digesting capacity than others—that is, any one breed that stands out more prominently than another in the capacity from the same amount of food and similar care to produce a larger number of pounds of beef, and a greater flow of milk?—There is nothing so prominent as to be admitted generally. Each man has his favorite breed, and claims it is the best. The Shorthorn friends claim that their breed is capable of furnishing more beef and more milk from a given amount of food than any other breed; the Hereford fanciers claim that they can get more beef, but they do not claim it for milk; and the friends of the Holland cattle, improperly called Holsteins, make the same claim, not for beef, but for milk, and perhaps they have as good reason as any to make that claim, for their cattle are extraordinary milkers. They will produce more milk in proportion to the weight of their bodies than any other class of cows.

Q. And in proportion to the consumption of food?—I have had no means of testing that point, but that is claimed for them too. I have had no experience in feeding this breed.

By Mr. Fisher:

Q. Can as much butter be produced from their milk?—Not from a given weight of milk, as from some other breeds. Their milk is rather poor in butter, but in cheese it is good. It is pretty good in butter also, but neither as much butter or cheese can be got from a given weight of their milk as from some other breeds which give less in quantity.

Q. How do they compare with the Ayrshires in richness?—They are about the same.

By Mr. Ferguson:

Q. Is it not almost admitted by every one that the difference in the value of milk in consequence of the ingredients it contains, is more the result of feeding than from the breed of the cow?—No; that is not admitted.

Q. Has the contrary been proved?—Yes; pretty well.

Q. I would like to know where?

By Mr. McNeill:

Q. With reference to that question, which is one of very great interest and value to the country, to ascertain the comparative values of different breeds of cattle upon the same feed, I think it might be well for me to mention that I am informed by Mr. Benson, M.P., who gave some valuable information on this subject before the Ontario Agricultural Commission a few years ago, that his experience with Herefords and Durhams is that the Hereford is the best for ordinary conditions, while under the highest possible conditions, the Shorthorn is the best?—

That tallies very well with the results of experiments between the Shorthorns and the Herefords, in the West.

Q. In discussing the various breeds, I would like to ask whether you have had any experience with Guernseys?—I have not, personally.

Q. Have you seen any reports of results of experiments with Guernseys?—Yes; in all the reports they are spoken of as comparing very favourably as an excellent milking breed.

Q. Have they been, as far as you know, as extensively introduced as the Jerseys?—No; not so extensively. There have been a few introduced, but there is not enough to make a popular impression. The tendency, however, is very favourable indeed. But there is another breed which, I think, is likely to become an important element in dairying; I allude to the Swiss breed of cows. They have characteristics which promise very high, but very few of them have been introduced into this country as yet. They have an advantage over the Jerseys and Guernseys in the fact of their greater size.

Q. Are they larger than the Guernseys?—They are a good deal larger than Guernseys; they are nearly as large as Shorthorns, for their cows will weigh from 1,400 to 1,600 lbs., and they give a large quantity of rich milk. I have no doubt that before many years there will be a boom in that breed, corresponding to that which is now going on in the Jerseys.

By Mr. Kranz:

Q. What variety of Swiss cattle are they?—I do not know their particular name; but they are of a dun color. They are neither black nor white.

By Mr. Cochrane:

Q. In connection with feeding turnips and their effect on the flavor of the milk, I would like to know if milk is not also affected by the cows inhaling bad odors in the stable?—Yes; the stable odor which you get from milk in the winter time is almost all derived from the cows breathing the foul odors of the stable. The taint is taken into the circulation and from thence it goes into the milk.

Q. Is it not known as a fact that the odor from carrion in the field, or from fish offal, used as manure, will affect the milk in cows coming in contact with it?—There is no doubt of that fact. I have had it in my own experience, when I was unaware of the existence of carrion which lay near my field for two or three days and affected the milk before I found it out. The cattle went past it twice a day, and when the wind was blowing in the right direction, they got the scent of it only in a walk of from 12 to 15 rods, and yet it affected the milk in that time.

Q. Do you not think the smell of turnips has something to do with affecting the flavour as well as taking it into the stomach?—No doubt it has. I never knew an instance of that kind, but it could not fail to do it.

By Mr. Ferguson:

Q. Can you give us an idea of the amount of food eaten or digested which goes to sustain the animal frame, in proportion to the weight of the animal, and in proportion to the amount of food which goes into the production of the milk elements? What are the relative proportions in large and small cows?—All the experiments that have been made touching that point, go to show that a large animal consumes proportionately less food for support of the frame than a small animal, all other circumstances being the same.

Q. Do you know what proportion of the food eaten is retained by the animal to keep up the household fuel, as it were?—Where you give the cow just enough to sustain her, it will all be retained. For instance, if you have an animal weighing 1,000 lbs., it takes an equivalent to twenty pounds of hay a day, at a temperature of about sixty, degrees to maintain heat and supply waste. The material which is in twenty pounds of hay will sustain a cow at that temperature without gaining or losing, for twenty-four hours.

Q. The reason I ask that question is this: I find that the animal must be maintained, and it is only by giving an extra amount of food above what is required to sustain the system that any return in milk can be expected?—A cow will give milk

in proportion to the amount of food that is given over and above what she requires for her own maintenance. Take an average cow and feed her all she can digest, and not more than one-third of what she eats can be appropriated to milk; the best experiments go to show that, as a rule, a less liberally fed cow will not convert more than one-fourth of her food into milk. So that, if you reduce the food it will be less, and the milk will be poorer in quality.

The Committee then adjourned.

OTTAWA, 1st March, 1884.

The Committee met. Mr. W. H. LYNCH, of Danville, P.Q., called and examined

By the Chairman:

Q. What is your profession?—For the past three years I have made dairying—especially butter making—a specialty.

Q. In Canada?—Yes.

Q. How would you divide the different branches of dairy farming?—I would divide them into butter making and cheese making. Regarding the manufacture—into farm dairies and factories, or, in other words, private diaries, and co-operative dairies. The co-operative dairy embraces the cheese factory, where cheese alone is made, and the skim-cheese factory, where butter is made from a partial skimming of cream, and where skim-cheese is made from the skim-milk. It also includes the creamery, where butter alone is made. The creameries are of two sorts—one to which all the milk is brought and the butter extracted, and the other, where the cream gathered from the farm is taken. Then there is another branch, that of selling milk. I do not consider that it comes under this division, particularly, except in a qualified sense, because it does not not enter into our export trade. Selling milk is an industry of a local character, except where the milk is condensed; though milk condensing is itself an important industry, or can be made so.

Q. Are there any advantages, in your opinion, in one sort of dairy farming over another, either in cheese making or butter making?—In cheese making, the farmer has the advantage of utilizing directly the whole milk product into a marketable article. In butter making, the farmer has the advantage of utilizing a portion only of his milk product, in making an article (butter) that has a high market value compared to the feeding or home value of the raw material, and retaining that portion (skim-milk) which has a high feeding or home value compared with its market value as a manufactured product. Butter making favours the keeping of stock, the feeding of young cattle, and consequently the keeping up of the land. Butter making does not exhaust the soil at all. Cheese making does. The loss can be put back at a low expense, say about 50 cents a cow per year (forty pounds of bone dust would do it), but there is a chance that it would not be put back, and as a consequence, the land would deteriorate.

By Mr. Cochrane:

Q. How do you explain that taking milk to the factory and making cheese out of it exhausts the land more than churning it does?—More than butter making does. In butter making we have the skim-milk remaining, to be fed on the farm. Butter takes nothing from the farm to exhaust the soil, but by taking away the skim-milk valuable nitrogenous material is removed from the land, which must be replaced.

Q. Would you think, if we had a continuous pasture kept up by artificial manure, it would make any difference to such a pasture whether the skim-milk went or not?—No; it would be simply the cost of the artificial manure. If that were put on the farm, we have simply to count that extra cost against the cheese making. The chief difficulty is the fact that the constituents removed from the soil are not replaced, generally; consequently, as a matter of fact, the land deteriorates in a larger measure than in butter making. I simply point this out to show that there is this much in favour of butter making.

By Mr. Farrow:

Q. When the whey is taken back to the farm and fed to the calves, what effect has it?—That is better than not doing so. The whey is usually counted at about one-fifth the value of skim-milk. For feeding purposes, it may be made two-fifths of the value of skim-milk.

Q. By mixing it with what?—Bran or shorts, or feeding clover with it, to supply the elements which will make it a rightly balanced food. These elements can be supplied in this way, and they make it two-fifths of the value of skim-milk, whereas in the other case it would be only one-fifth of that value.

By the Chairman:

Q. How do the direct profits in the different branches of dairying compare?—They may be said to be about the same. A great deal depends upon the market. The market is affected by the quantity and quality produced. Where prices rule relatively higher for one product than another, the result is a larger production of the one, and a lesser production of the other, and that tends to adjust the supply.

By Mr. Trow:

Q. Would you approve of returning the whey to the farm? Would returning it in the same vessel not injure the cheese?—It could be returned to great advantage, as it is valuable to the farm for feeding, but in common practice it does harm, perhaps, more than good, because if returned in the same vessels, and the vessels are not properly scalded, active germs are left in the vessels, and that affects unfavourably the quality of the milk. This is one of the great difficulties, in cheese making, to be overcome. But still it does not follow that there need not be improvement in the way of returning the whey.

By Mr. Farrow:

Q. That is a point of cleanliness altogether?—Yes; in its largest sense.

By the Chairman:

Q. Would you advise farmers to change their special branch of dairying, whenever prices are favourable, to another branch? For instance, suppose a farmer is making butter, and the price of cheese becomes relatively highe than that of butter, would you advise him to change to cheese?—I would strongly advise him not to change. There would be no advantage in it, because he would always be behind the market. He would just get into the new line of things when the market would change again; then, the prices of the article he is producing becoming low, he would have to decide anew to change about. It would be better for him to keep continually at one specialty for a length of time. A disadvantage must accompany frequent changing, compared to continuous and so ever-improving production.

Q. What branch would you advise farmers to adopt?—I would let it be determined by the condition of their location, having due regard to the soil, the retaining of its fertility, and its adaptation for the production of the raw material. It should also be determined by their means of manufacturing, their markets, prices, &c. There may be profit in butter making alone, in cheese making alone, in butter and skim-cheese, or in both butter and cheese. Each farmer should let his local conditions govern him. He should take all these matters into account, then select a branch, and having selected it, follow it until he has some good reason to change permanently.

Q. Which do you consider the more profitable—making dairy goods in the home dairy, or in the factory?—That would depend upon circumstances. In the ratio that the home methods are perfect and satisfactory, the advantage is in the home dairying; where the methods are imperfect and unsatisfactory, there are advantages in the co-operative system. There are districts in Quebec where the returns from the dairy have been extremely small, owing to imperfect methods, while the factory is now very successful and poplar. There are other places where factories of the same sort, fully equipped, and once in operation, are now lying idle. Other things being equal, the advantage in cheese making is in the factory, but it is not so in butter-making.

Q. When you speak of factories lying idle, do you refer to cheese factories alone, or cheese and butter factories?—I speak particularly in reference to cheese factories. But it is true of butter factories. I am told that there are butter factories lying idle in Eastern Ontario. As to the cheese factory idle in Quebec I have personal knowledge.

By Mr. Fisher:

Q. Is not the fact that these cheese factories lying idle is due to the fact that the farmers have turned their attention to butter, and that they are making dairy cheese in contradistinction to factory cheese?—Yes, that is true; but I am speaking especially of buttermaking in the home dairy.

Q. That is simply a change from one system of dairying to another system of dairying, not changing merely from the factory to the home dairy?—It shows what I claim, Take, for instance, where the cheese factories are lying idle to-day. Butter was being made in the same way and under the same circumstances as now before the cheese factory was started. The factory became popular for a while; but the farmers have reverted to butter making, because their buttermaking methods are relatively better. In the other cases, where they have not left the factory, it is because their butter making methods were imperfect previously, and their return per cow small, while now it is relatively large. They persist in the opinion that the cheese factory is the sole mode of profitable dairying. In the other cases, they tell you that the cheese factory is a failure. So it depends, among other things, upon the local conditions of the farm dairy, in point of method. I may repeat that other things being equal, the advantages are for cheesemaking in the factory and for buttermaking in the private dairy.

By Mr. Cochrane:

Q. Where there is a creamery going to be established which do you think is the preferable way to get the cream—to deliver it in the milk or in the cream?—I must give a similiar answer to that question. It would depend on circumstances. The fairlamb, or cream gathering system, is more successful in the Western States than anywhere else. The conditions there were peculiar. The farmers had been producing mainly wheat or other grain on a large scale. Their farms were large, and homes comparitively far apart. Their buttermaking methods were very imperfect—Western butter being at one time hardly passable as butter at all. The farmers were well to do; they were indisposed to take up buttermaking largely at home, because of the labour. These conditions were very favourable for the cream gathering system which left the milk on their farm to be fed to stock, and left but a small bulk to be carried to the factory. Therefore, the system in the West has progressed rapidly. But it will not do to argue from this that it would be equally adapted for Vermont, or Quebec, or Ontario. In fact we have every reason to suppose that it will not. The conditions are different, and it is reasonable to expect that the system means merely a transition state of things, a condition of things that may be changed and which will eventually give way to some other system.

By Mr. Farrow:

Q. Do you not think there are large parts of Ontario, especially in the West, where it would apply equally as well as in the Western States?—There are parts of Ontario where the conditions are similar, where grain growing has been carried on on a large scale, where the same defective methods exist, which give an indisposition to push the private dairy very much. Here it might be successful, but I have no doubt, if an effort were made to improve the private dairy, it would also be successful. I do not think the state of things to which I have referred will become either general or permanent.

By Mr. Cochrane:

Q. How does it effect milk, for making butter, to haul it a long distance, say 3 miles?—It is no help to milk. It may be carried without disadvantage, if it cooled down quickly, promptly, well aired and carried at once. It may be set after heating it up, so as to get the cream out of it, with very satisfactory results; but more is

required than in cheese making, and consequently, in practise, this is against the success of the creamery.

Mr. Allison (Lennox):

Q. Would it not affect the cream more than the milk to carry it?—Cream gathered for butter making, varies more in value than milk does, ordinarily, for cheese-making or butter making. Consequently, here is an objection to the cream gathering system; it is unfair to some of the patrons. It has been shown at a recent convention, upon what must be considered good authority—Prof. Roberts, I think it was—that the variation—taking sixteen as the average—was from eight to twenty-four, in the value of the cream. The worst of it is, that those who advocate the Fairlamb system, make an apparently reasonable claim, that creams differ very little, if any, in value. It has been urged to me, that the system was favourable for that reason, whereas, the truth is cream varies more than milk, in its value for their respective purposes.

By Mr. Cochrane:

Q. How do you account for that?—There are different reasons; for instance, it may be affected in the manner of setting it, in the way it is handled, then in its nature itself. But I should suppose it was largely owing to its being mixed more with the milk in one case, while in the other case being more condensed. Cream raised in an open, shallow pan, is not so bulky as is the cream raised in deep-setting vessels, cooled by water. While it is less bulky it will give more butter.

By the Chairman:

Q. Would you look to these factories becoming fewer as the home dairies improve?—Yes; in a large measure.

Q. Is this equally true of both branches of dairy farming?—It is more true of butter making than of cheese making. The co-operative system is likely to succeed better in cheese making than in butter making.

Q. Why?—Milk may be transported to better advantage in the one case than in the other, and the cheese value of different lots of milk is less variable than the butter value. It requires more skill to make cheese at the home than to make butter. This is in favour of cheese making in the factory. Again, cheese making utilized a larger proportion of milk, leaving less to be used on the farm. Butter making, on the contrary, leaves a large proportion for the home or farm use. I have stated already that the division of proceeds are more equal in cheese making than in the other cases. An additional reason for this is, that milk can be delivered once a day in cheese-making, and it is necessary to deliver it twice a day in butter making, which makes an extra cost. There are other reasons, but these are the chief. They show that the conditions are different, and that they are in favour of cheese for the factory and butter for the home.

Q. What is the state of the dairying industry throughout the Dominion?—With regard to cheese, the industry is in a very gratifying state; especially in Ontario and Quebec and, so far as quality is concerned, also in the other Provinces; but with regard to butter it is most unsatisfactory. A great deal remains to be done in cheese making. A great deal is faulty, but the recent progress made gives promise that we shall shortly be well advanced towards perfection in that industry. In regard to butter making, it certainly is not so promising. Individually, I think there is promise, but I find it very hard to inspire confidence in dealers, in many farmers and leading men of the country, in the future of the butter industry. It is really in a deplorable condition. Butter dealers in Montreal tell us there is no market for butter. The industry at present is certainly not in a satisfactory condition.

By Mr. Cochrane:

Q. What reason do you give for that; why cannot people be educated to make butter as well as cheese?—I think I have in part given the reason. Cheesse making has been taken from the dairy and placed in the factory. It was suited to the factory more than butter making. It is not to be expected that butter making can be taken from the dairy as cheese making has been.

By the Chairman:

Q. Has the cheese industry always been in that state or has it been improving—I mean in Canada?—It has been improving during the last decade; in fact, the real progress has been made since then. Before the successful operation of cheese factories there was no more a cheese industry than there is now a butter industry.

Q. What are the chief causes of the improvement in the cheese industry?—As I have already said, co-operation.

Q. May still further improvements be looked for?—Yes.

By Mr. Farrow:

Q. I understand you to say that cheese as made now is not up to the mark; this is owing, I suppose, to incompetent makers?—When we employ a cheese-maker we do not know his capabilities and often get imposed upon. I am connected with a very large factory, a joint stock company. We have had seven year's experience. We manufactured 105 tons last year. We have been fortunate in cheese-makers. The one whom we have had for the last four years was a good man. This year we have engaged a new man.

Q. What plan would you suggest to insure competent makers so that the people would not be imposed upon. Could they not be examined somehow?—In regard to the first point, I would like to qualify the impression I may make, when I say that our cheese is not up to the mark. I say it is not what we ought to expect. I would not depreciate it, as it is, because relatively, as regards cheese made elsewhere, it is high; but certainly it is not yet where we would like to have it.

Q. You have mentioned one of the difficulties, and a very great one?—There are others, as well, and they all might be met by Government action—not alone by Government action, but by individual enterprise and Government assistance or help, combined. One other cause which I might mention, is the use of imperfect appliances, necessitating great skill, and it is, I think, greater than the one you mention. Suppose we have an unskilful cheese-maker working without the advantage of mechanical helps, we will have a very poor result. We may take the same man and give him these mechanical helps and we will have a comparatively good result, for the reason that we have eliminated largely the necessity for skill. He then works more by rule. As an illustration, let me mention the use of rennet. A man who can make rennet, and knows how to use it, with the varying conditions of milk brought to him, must be a very skilful operator, more skilful than the average of our cheese-makers. But give an ordinary cheese-maker a rennet the strength of which he knows, and the rule by which to work it he knows, and he arrives at one step to the condition which makes all the difference between a good article and an article which is not fit for the market. Cheese made with bad rennet is something almost bad enough to be legislated against, because the use of rotten rennet and its future action upon the cheese may render the article far less fit for the table than well-made oleomargerine. And yet it is allowed to be placed upon our tables and we are supposed to eat it. Aside from its influence upon the market and the industry, it is wrong that an impure article should be placed upon the market at all. So that it is an important thing, and you can see that there is a good deal of difference between the cheese-maker buying the article already made, knowing its strength, and knowing how to use it, and the cheese-maker trying to make it himself and making it very imperfectly. The Inspectors sent out by the Ontario Government, in this connection, mentioned this matter at the recent conventions, so frequently and so prominently, that you would think it was the only difficulty met with. The complaint is "bad rennet," "bad rennet," "so much bad rennet." All this points out the immense importance of rennet. The difficulty may be met in a very short time, not by educating these men up to the point of producing their own rennet, but by inducing them, in some way, to use a rennet which is in the market, which will serve their purpose admirably.

By Mr. Trow:

Q. Are there any substitutes in the stomachs of animals for rennet?—Not to my knowledge.

By the Chairman:

Q. There is an impression, more or less common, that the factories revolutionized the cheese industry, and will do the same for butter making. Is this well founded?—I think it is not, as regards butter-making. As already shown, the conditions are different to those which govern cheese. There is another difference yet to be noticed. When the co-operative plan was introduced, there were two branches of private dairying carried on—butter making and cheese making. One could be taken and there would yet be one left. Now that one has been taken, there remains but one. To take this away leaves none. It was very natural that the one best adapted to the factory would leave the dairy, and that the one best adapted to the farm would remain. This did occur, and cheese making is therefore largely a co-operative industry removed from the dairy, while butter making remains essentially a home industry. As a matter of fact, there are many reasons for believing that private dairying will continue to exist, no matter what the defects may be, and that as improvement is made in the private dairy, it will not only hold its own but be likely to increase.

Q. Have you any statistics to bear you out in your conclusion?—Yes. The expectation that the private dairy will give way to the factory, is based upon the supposed fact that it has done so in cheese making. It is a striking commentary upon such a claim, that after twenty years of co-operative dairying in the United States, there is yet more than twice as much cheese made in the home dairies as there is butter made in the creameries proper, and within 2,000,000 pounds of as much cheese made in the home dairies as there is butter made in the factories altogether—in creameries and skim-cheese factries. Again, 74 per cent. of all the dairy products of the United States consist of butter made in the private dairy; while the butter, so far, made in factries, altogether is less than 3 per cent. of the whole dairy product. The cheese made in factories is, as yet, only 20 per cent. of the whole dairy product. The state of things in Canada cannot be materially different.

Q. What do you hope from the cream-gathering system?—I belive it will serve a good purpose where the conditions are adapted for it. It will serve a good purpose, as the creamery serves a good purpose, as a cheese factory serves a good purpose. But as to its future, I do not claim that any of these are necessarily going to be permanent. I do not think we need to claim it. I think we ought to accept things as they are, make them best at every point and leave them to settle themselves.

Q. Has there been any great change in the character of agriculture in the immediate past? In connection with that question, if you will allow me, I will give you an opinion somewhat long, but very valuable, on that point. I visited the Experimental Station in New York, a week or two ago, where Dr. Sturtevant handed me their report. In the beginning of the report are some points made by the President of the Board of Control, as it is called, which, in a condensed form, gives the basis of Government action, and is worth re-producing here:—

"The New York Agricultural Experimental Station has grown out of the necessities of the farmer. Within the past forty years the conditions of success in practical farming have changed greatly; they are more complex, there are new elements, hindrances not known in the earlier husbandry of this State, natural and artificial influences to increase the hazards of all crops, discouragements that have driven many thousands of our citizens to newer fields in the West, and seriously lessened our own productive industry. Among these hindrances and discouragements are the ravages of insect pests, many kinds of recent introduction, changed character of the seasons, especially in more frequent droughts during the summer months, new and fatal diseases in flocks and herds, multiplication of injurious weeds, and in many localities serious exhaustion of soil. In the cheapened transportation of all products of farm industry from the more fertile fields of the West, our farmers have found competition against which they may contend successfully only by the employment of the highest skill, and even with that accessory, they must be content with diminished rates of profit on the larger capital invested.

"All these adverse influences, operating with accelerated force, have had visible effect in depriving the agriculture of this State of that encouragement which is necessary to healthful growth and development, and they have also been the immediate cause of transferring to other States a material portion of the labour that under more favourable conditions would have remained to preserve and increase the importance of our own Commonwealth. In view of the increasing disabilities pressing heavily upon every branch of farm industry, thoughtful farmers long ago began to seek means of relief, mainly in more thorough tillage, better protection for farm animals, improved seeds, extensive drainage, artificial fertilizers, and generally in the acquirement of knowledge leading to higher skill in all the methods of their labour. Without doubt, they have corrected many of their own faults in farm management, but they have not been able to ameliorate the conditions of their industry, except as individual skill and effort have wrought favourable change, the principal difficulties still existing, because individual effort has been wholly inadequate to cope with them.

"Every advance has given a clearer view of obstacles too great to overcome, except through some form of organization by which there might be greater and general attainment of knowledge in all that constitutes the science of agriculture, and the requisite skill to make such knowledge available in farm practice. The various agricultural societies of the State, although useful in their respective fields, have been quite inadequate to the correction of evils fastened upon an embarrassed industry, assailed by forces mysterious in their origin and destructive in their work, devastating fields, decimating herds, blighting fruits, and otherwise nutralizing the faithful labour of the husbandman, who has thus to contend in the dark against increasing odds. In the various branches of physical science in which intelligent, practical agriculture must find direction, there has been material advancement in the last few years, but it has not been general. Here and there a student, stimulated by unselfish enthusiasm, has engaged in a careful research, planned for the development of truth, and his labours, pursued at great cost, perhaps, have been indeterminate, the results problematical, their application doubtful, because in all there has been no authoritative expression supported by extended tests.

"These considerations having at least the force of unanswerable argument favouring the establishment of a State Experiment Station, attention was given to the want especially by the principal agricultural societies within the State, including the State Society, the State Grange, the American Institute Farmers' Club, Central New York Farmers' Club, Elmira Farmers' Club, and Western New York Horticultural Society, to which was added the influence of Cornell University, and the express desire of farmers throughout the State, for a station where experimentation, supported by the public, might solve the thousand perplexing problems affecting the welfare of agricultural industry. In compliance with this desire, the Legislature of 1880 authorized the establishment of the New York Agricultural Experiment Station, the work to be directed by a Board of Control, comprising ten members, who were the executive officers of the agricultural societies already named, and *ex-officio*, the Governor of the State, and two others, to be elected after organization. In February, 1881, satisfactory agreement was had, the plan of work embracing the purchase of a suitable farm and its equipment with all the appliances for careful field experiments, together with scientific investigation, and the employment of a capable director with a staff of assistants to take immediate charge of the work.

"As the preliminary step, exceedingly important in all its bearings, the selection of a farm became at once a matter of deep concern. Proposals were invited and received from twenty-two counties of the State, but choice at last designated a very desirable farm, near Geneva, admirably located, with buildings very suited to the purposes in view, soil and accessories well adapted to the objects sought."

By Mr. Cochrane:

Q. What would be the expense for the equipment of a private dairy, to make butter?—It ranges from $30 for about five cows, up to about $50, according to the equipment you would get.

Q. Can butter be made successfully in a private dairy without running spring water or ice?—I think all the operations of butter making may be carried on in the farm dairy, provided you have water at all, of a temperature as low as from 60 to 50 degrees—better, of course, at 45 degrees. I think that by the aid of improved appliances the inferior butter that we now have, which is owing to defective skill, or want of skill, may be improved. Referring to my system, I would simply say that the difference between it and other systems is in the broad question of skill *vs.* mechanical helps. It is not necessarily the employment of one person's implements or another's. In Denmark, after a period of fifty years, during which attention was given to this subject, after about twenty years of very active work and an expenditure by the Government, very large for such a comparatively small country, namely, $10,000 a year, they have succeeded in producing the best butter, so far as exportable marketable butter is concerned, of any country. This is owing to the superior skill of the farm dairymen, and that skill is owing to the persistent teaching and instruction which it has been the policy of the Government to give, and the use of improved implements. Their best skill averages higher than ours. Their implements are, perhaps, better than ours have been as a rule. But I claim that butter making, being a mechanical operation, may be reduced almost to a mere matter of mechanical appliances. This has already been shown. To-day, the success of cheese making has been the result of the use of mechanical helps, as against imperfect home methods. Cheese factories have been pretty well equipped from the very first, and these equipments have been so improved that they approximate perfection to-day. This is not true of the home dairy, and it is hardly true of the creamery. Even the latter is not yet equipped quite to the degree that the cheese factory is. Now, if we make it a question of mechanical aids, the private enterprise which will introduce these mechanical aids is going to do more quickly and more effectually what it would take a great length of time and a great expenditure of money (over so much larger territory that we have compared with that of Denmark) for our Government to do. I can show you from the beginning of butter making to the end of it how it is a question of mechanical help, or can be made so. Begin with cleanliness, a thing which is important all the way through, both in cheese making and butter making. The methods of milking are such, at present, that dirt frequently falls into the milk and soaks into it, and the milk extracts from that dirt all that is most objectionable in it and unfit for food. This milk is poured out into the vessels from the strainer. As this dirt goes into the vessel from the strainer, the milk carries the essence of the dirt along with it and leaves on the strainer what it would be much more pleasant to eat than is the essence of the dirt that goes through into the milk. This can be avoided, largely, by the use of mechanical appliances. There are several implements in the market which claim to do this, by straining the milk while milking, so that the dirt is left behind, and the milk goes away, strained, into the closed vessels.

By Mr. Trow:

Q. This is done during the process of milking?—Yes, simply by the use of an implement designed for that purpose. What I claim the farmer should do is to select such an implement. The question before him is, where can they be procured and which is the best? That is a matter of supply and demand for each man to determine for himself. Then again, with reference to temperature. If you were to bring me cream and ask me if it were the right temperature for churning, I am not experienced and skilful enough to tell you by putting my finger into it. But give me a thermometer and I will tell you exactly. If it is too cold, I can easily raise the temperature with a little warm water. It is easily warmed, and I can bring it to the exact point I want it. If it is too warm, I will cool it. I do it by rule. Here, then, is another difference between the old-time rule-of-thumb way of doing, and the improved method with the aid of appliances. Take the churning process. The grain of the butter is often injured in the ordinary way of churning, but this, too, may be avoided by appliances; and, besides, even defects that were in the cream may be eliminated in the process of churning. Objectionable overworking may be guarded against by proper methods of churning. A churn is wanted which will not break

the grain of the butter. Here, again, it is a matter of mechanical appliance. The churn should be adapted to washing the butter when it is in a granulated form, so as to free the butter from the buttermilk; because after the butter has come, there is floating in the buttermilk the membraneous matter, or caseine, which is removed from the cream globules, little shells, as it were. As the butter keeps gathering and gets into lumps, it locks up these shells in one large lump. When once this sold matter is locked up (the consistency of the butter when worked being comparatively soft), the lever, or the hand, is pressed upon it and the consequence is the liquid is pressed out, but the solid matter remains in the butter. This matter becomes a part of the butter itself. It is impossible, by any system of working, to completely and satisfactorily work it out afterwards. By attempting to do so, one is in danger of overworking it. But by drawing away that buttermilk immediately, by putting in cold water to cool it down and harden the granules of butter, one may wash it perfectly of all this, and then has simply to work out the water and work in the salt. In this way much less working is required, to the saving of the grain of butter. One with a little skill can work in the salt while the water is being worked out. This is the most favourable time for working in the salt, because if the salt is worked in when the butter is very dry, the hard crystals have a tendency to break the the butter grain. Consequently, by a simple mechanical process, one eliminates a great many of the difficulties of butter making. I have churned in that way and eliminated the effects of bitter cream. I have also anticipated the effect of overworking. Therefore, by this process we can look back or anticipate to prevent bad results. With regard to raising the cream, instead of having open vessels, little shallow pans, which are quite expensive and require a great deal of room, besides great skill and a knowledge of the variations of the atmosphere, and from which one can get a first-rate article of butter only by the exercise of great skill—instead of having those, we can utilize large vessels, by the application of water which is less variable, as a rule, than air. Even if we could not get so fancy an article by that method, we can certainly get a first-class, marketable article, cheaper and with less skill. We can skim our cream under this method automatically. One of the objections to the Fairlamb system, as urged at the late conventions, was that it is difficult to skim the cream properly. Now, the milk may be skimmed automatically by having an apparatus for it. Instance also the cream-holder. Dairymen sometimes use more than one cream-holder to hold the different skimmings of milk intended for a single churning. The consequence is, that the first cream gets too old, and the last cream is perhaps not old enough. If these different skimmings had been kept in a single vessel, and thoroughly mixed, the result would have been more satisfactory. The added cream would have retarded the ripening of the first, and the ripening of itself would have been accelerated. Consequently, the ripening of the whole would be uniform. The result would have been more butter, because more of the cream would churn, and better butter, because none of the cream would be over-aged. This result may be secured without any patent arrangement, necessarily, at all. It is simply a question of size. So, give the butter-maker a cream-holder. He should have one just the capacity of the churn, that would prevent him from over-filling his churn. Knowing the capacity of his churn, he will put the right quantity of cream in it. Then there should be directions on the cream-holder, instructing the operator always thoroughly to mix the cream as he puts it in, and not to put in the fresh cream, but to allow the cream, after the last has been put in, to remain about twelve hours at about sixty degrees. This is a simple rule, and will lead to a larger percentage of butter than people are ready to believe, as well as to better quality. The same thing is true of the appliance known as the "butter-worker," which is designed to meet the objection to the hand coming in contact with the butter in working. This appliance is so simple and inexpensive that any farmer can afford one. Another matter which forms a part of my system is this. It has been stated here by Prof. Arnold that butter has been kept for three years. This is true, but it can be kept only in its granulated form. If one allows it to gather into large lumps, and then throws it into brine, it will not keep. Suppose one has too few cows to give

milk enough to fill a tub with butter at one churning. The plan has been, in the past, in such a case, to put the butter in different layers. This is a defect in the butter. But if the farmer will churn his butter, wash it in the granulated form, and retain it in that condition in a suitable butter-holder, that defect will be remedied. He need not work it the same day, he can wait to work a larger quantity. He simply churns it, washes the churn, and puts it away. And by this means he is ready to churn more frequently, and he avoids the effect of letting the churning be delayed too long. Now, by having this granulated butter-holder, and following this system, he can have his butter packed at the most suitable time, save labour, improve the quality, and remove the strongest objection to the private dairy. When I point out to you that 74 per cent. of all the dairy products of the United States is butter made in the private dairies, it shows the necessity of improving the private dairy, whatever may be the future of factories, of the Fairlamb system, or any other system. This method of mechanical appliances meets the chief wants of the private dairy, and places it on a par with the factory. Then again, there is the question of a suitable package. Give the farmer a machine-made tub, such as our farmers have, and if he follows the directions given in Prof. Arnold's book, he can probably treat the tub to prepare it for the butter. By the action of salt, one may draw from the tub the sappy matter that would otherwise be drawn by the salt of the butter into the butter, leaving the tub greasy and the butter imperfect. Now, if a farmer had a tub, upon which were printed simple directions how to treat that tub, he would be far more likely to follow them than he is under the existing state of things. Here is the case of a mechanical appliance, doing away with the great evil of butter spoiling; after it leaves the hands of the farmers. A great deal is said to-day about imperfect butter, but it is not altogether owing to the want of skill on the part of the farmer, it is largely owing to the contingencies to which the butter is subjected as it passes from the maker to the consumer. These difficulties can be met largely by mechanical appliances. My system is to utilize appliances in every way possible to meet the difficulties as they appear in this butter-making industry.

By Mr. Trow:

Q. You do not approve of keeping butter; keeping butter for a length of time, like cheese, does not improve it?—It is not necessary to keep it for a great length of time. The policy of makers should be to put it on the market at once, because if it gets slightly deteriorated the oleomargarine will be preferred before it. The best quality of butter in the market will be selected at the highest price; but immediately it begins to get rancid the fresh-made oleomargarine, made to order practically, will get ahead of it. Then the butter will be thrown back, and it may be left on the market till it will not bring more than the price of grease.

By Mr. Hesson:

Q. Is it not a fact that butter is made worse after it is passed into the hands of country dealers by their system of handling?—I was told by a dealer in Toronto that, do the best I might in order to improve the dairy industry, there would remain this difficulty, that the dealer would take in all butter at the same price, being afraid to hurt the feelings of customers. Then the dealer would use very little skill in handling it, he would mix different grades, and the consequence would be that a great deal of butter would pass from his hands in such a condition as to spoil the trade. He asked me how I proposed to get over that. I said that improving the quality is the only remedy, but that remedy will go a long way towards removing the difficulty. It has been claimed that the farmers make poor butter; that 90 per cent. of the butter is bad. This estimate is far too large. A large portion of the butter is sold immediately in villages and towns by the producer. It is shipped direct by his customer, perhaps to Boston, Portland, Montreal, Quebec, Toronto, and never finds its way into the general market at all. That is the best butter made. The village people and town people select the very best butter, at whatever prices it may be, and this of course goes immediately from the producer's hands into the hands of the consumer. That fact is not taken into account when we are told that 90 per cent. of the butter in the market is not a marketable product. It is true, in so far as the

butter quoted is concerned, but we must remember, in this case, the blame should not be laid on the farmer altogether. The defect is attributed, to some extent, to the manner in which the butter is handled after it leaves the hands of the farmer.

Q. Why is it that the eastern townships have the credit of making the best Canadian butter?—For years there has been, in that part of the country, excellent butter-makers. They make butter making more a speciality than the Ontario farmers have done, consequently they made more good butter for the market.

By Mr. Cochrane:

Q. Is it not the practice there to pack the butter in tubs rather than to take it to the stores?—Yes; it is more the practice there to do so, because the butter is made in larger quantities. In Ontario, where they make small quantities, it is taken to the stores. In the Eastern Townships it is made and kept until several tubs are packed; the butter is thus better and more uniform than that sold in small parcels.

By Mr. Fairbank:

Q. What is the best manner of avoiding the great damage which is done by merchants in handling butter? Is it not best to encourage the farmers to do it up in small packages?—Yes; and this is one of the reasons why it is so important that this improved utensil should come into general use. With the use of the butter-holder, the farmer, no matter how small may be his daily product of milk, can hold his butter over until he is able to fill a package at a time.

By Mr. Cockburn:

Q. Does the Eastern Township butter sell higher than the Eastern Ontario or Morrisburg butter?—The Morrisburg butter is going up, I believe, but it has been quoted under the Eastern Township butter.

By Mr. Trow:

Q. I have followed your statement with reference to cleanliness in milking, in having an apparatus by which the milk would be immediately strained; but it strikes me that there would be something else needed, with reference to the next application; what would be the size or dimensions of the vessel you would place the dish in, and would it be of wood, earthenware or tin, and what would be the depth of the milk?—That is in milk-setting?

Q. Yes?—I did not enter into that. I may say that Professor Sheldon said last fall, at St. John, that the English farmer could not adopt the use of creamers (deep-setting vessels to which water is applied to raise the cream), for the reason that they had no ice there. But it is not absolutely necessary that there should be ice to cool the cream. In the use of ice, in the way that has been generally practiced, one had not only to use ice to cool the milk, but to cool the water surrounding it. That was uneconomical. Now, by having a reservoir, besides the vessel in which the creamer containing the milk is allowed to stand, and by allowing the water to run from this reservoir into the water vessel or chamber around the creamer, the heat of the milk goes out into the water and the water can be continually thrown off warm. All the farmers in this Dominion have on hand a sufficient quantity of water, either by bringing it in pails or pumping it, to cool down their milk in a proper deep setting apparatus. The improved system has the advantage of lessening the labour and getting a greater uniformity in the butter product with the same skill. In fact, I may say it secures a better product with less skill than the other system. I do not know that I need to explain the methods of setting, because that is a process which, when once seen, the farmer can imitate. These mechanical appliances will speak for themselves.

By Mr. Farrow:

Q. Will you give us a sample test, by which you can tell, by looking at the pan, whether all the cream possible has risen to the top?—I do not think all the cream rises in any case.

Q. The best test I have been able to find is this, you just take—if you do not like to put your finger through the cream—some instrument about the size of your finger and just pull it across the top of the cream so as to let it go into the milk If the cream parts and will not go back again, as much cream as possible has been raised,

or nearly so; but if the cream should close up, then it is not fit to skim, there is more cream to come up to the top?—That is true. But it simply tells you when it is desirable to skim, that no more cream will rise under the existing conditions; but it would not tell you whether or not the conditions are defective. We may look still further, to a process under which we know that we are getting all the cream that is in the milk.

By Mr. Hesson:

Q. What temperature is necessary for raising the cream?—Cream is raised best to a falling temperature. The best way is to set the milk as quickly as possible after it is drawn, for the reason that it is then in its best state to obtain a falling temperature. I would then reduce it to about 60° temperature, and I would have all the after operations carried on at as nearly as possible this temperature of 60°, even to keeping the butter. After you once get the milk cooled from its normal temperature when milked, to 60°, I would keep it at the latter temperature. In washing the butter in the churn, however, it is necessary, in order to let the granules harden, to lower the temperature to about 55°. Then the butter should be raised from 58° to 60° and worked, and packed, at that temperature.

By Mr. Fisher:

Q. As I understand you, you would not desire the animal heat to be extracted from the milk very rapidly?—So far as the so-called animal heat, or the odor, goes, the quicker you get it from the milk the better; but we would not wish to cool the milk to get it out, and then to have to set the milk at a low temperature, because, if we did, we would not get the benefit of the falling temperature. The condition most favourable to getting the cream is a falling temperature. If you heat up the milk to 120°, either by putting it on the stove or putting warm water into it, you get a still more favourable result, and by heating, you do something to get rid of the animal heat, or oder, which is objectionable.

Q. I think the ordinary heat of milk from the cow is about 90°?—About 98°.

Q. You wish to get the milk to 60°; would you desire to reduce it to 60° as rapidly as possible, and then let it stand there, or would you bring it down very gradually?—I would have the first cooling somewhat rapid, and the later cooling more slow. The application of water mechanically, will accomplish that, for the reason that there is a greater difference in the beginning between the temperature of the water and that of the milk. From 98° to 70°, the milk is passing through a critical stage, when it sours easily. For that reason, it is an object to cool it somewhat rapidly. When it gets down to 70°, the souring process is retarded, and by cooling it more slowly from that point down we may get a larger quantity of cream.

Q. Do I understand, that in that way, you can get all the cream you want in twelve hours?—I think so, under favourable circumstances, but when the conditions are not very favourable, it will require twenty-four hours, possibly, to get the cream.

By Mr. Sproule:

Q. Do you recommend vessels of a small or large diameter, narrow, deep vessels, or wide vessels?—Large vessels are an advantage, other things being equal. The larger the vessel one can use in which to raise the cream, the more economical one can do it, both as regards the cost of the vessel and the labour. But there is a limit as to the size of the vessel for cooling the milk. If it is very wide and long, for instance, one cannot cool the milk very readily to the centre; it takes a long while, and the milk will sour too quickly. The best shaped vessel, to my mind, is an oblong vessel, not quite so deep as some of the milk setting vessels now in use—say three-quarters of the depth—9 inches wide, and any length convenient. The depth may be from 15 to 20 inches. Make the vessel of a size to allow the milk to be cooled within a reasonable time, by the application of water. The water is best applied at the upper portion of the milk, even leaving the lower portion exposed to the air.

By Mr. Fisher:

Q. In the ordinary setting of milk, in the Eastern Townships, is it not customary to let the milk stand from twenty-four to thirty-six hours, in open pans, before the cream is gathered?—Doubtless, some of the best butter has been made from open

pans, by having pure atmosphere in the dairy, and skill in all the manipulations. But it requires so much skill, that, as a rule, we cannot get the best butter in open pans. By the introduction of larger vessels, we may lessen the labour, and do the work more economically. We may utilize water, so as to make the work more mechanical, as against using our judgment with reference to the variations of the atmosphere. For these reasons, I make deep-setting a part of the system of scientific buttermaking.

By Mr. Sproule:

Q. What material are the vessels to be made of—wood or tin?—Tin is a very good material. Wood is good, only when it can be so prepared as not to allow the milk to soak into it. Common wooden pails are objectionable for milking. A good pail is a paper pail. There was a pail made by Mr. Eddy, a few years ago, of paper; it was impervious to water or fluid of any kind. That would be a good pail.

By Mr. Hesson:

Q. Is earthenware good?—I should think it would be good, but it is heavy and cumbersome. In some respects, tin vessels are to be preferred. With regard to earthen crocks, I have understood, that in some cases, the coating is imperfect, and allows the butter to get injured. Crocks are objectionable in point of weight and brittleness, and they do not meet the conditions of our market. In saying this, I am referring especially to the needs of the export trade. With regard to the package it should be a cheap one, something that can be cast aside when it is done with, and that will meet the conditions of preserving the butter on its way to the market.

By Mr. McNeil:

Q. What do you think with reference to churning the whole of the milk in cases where farmers only have a few cows?—I do not think there is much advantage in it. I think it might be advantagous at times when they want plenty of buttermilk for local sale. There is extra labour about that system. In the other method, the cream can be extracted from the milk, as it were, automatically, and the butter obtained with less labour, in as large a quantity, and of as good quality.

By Mr. Fisher:

Q. You use the term, extracting the cream automatically. How do you do that? I meant without labour. Set the milk and the cream will rise of itself. There is another method, by the centrifugal machine, which further illustrates how much can be done by appliances. This machine has certain advantages in the separation of the cream from the milk. It has been called the centrifugal system of buttermaking, but it does only a part of the work of buttermaking; it simply extracts the cream from the milk. This is is done, in some circumstances, very satisfactorily, especially in large dairies and factories.

Q. I wish to ask you another thing; you spoke of the deep-setting vessels raising the cream within twelve hours. Have you found, or is it proven by experience that you can in that way obtain as much cream out of the milk as by the open and shallow-setting?—The first practice was by the use of deep-setting vessels surrounded by ice, and it was claimed by those who introduced the appliances that the cream could be raised in three hours. Apparently, the cream was raised, but really it was not. There was an apparent bulk of cream and a large quantity, but churning it proved that it was not there. But by slower cooling, twelve hours under the most favourable conditions, and twenty-four under less favourable, you will get all that is needed of the cream. What cream you could obtain beyond that would be so defective in quality as to depreciate the quality of the butter, although it would add to the quantity. The value of skim-milk is 25 per cent. of the value of full milk. When I speak of that value I speak of it in regard to its feeding value, especially for calves, and as to what it gives to the land; but if you must feed milk to your animals it has, I think, a larger proportionate value, perhaps 50 per cent., because the fat which you have taken from it, while it has a large market value as a luxury, has only a slight value as a nutriment, and that can be replaced by a very cheap food. Consequently, you can bring the milk for feeding purposes to almost its original value at

a small outlay, but care must be taken to keep the milk in condition. For suppose we set it in open pans and allow it to become old and sour, it undergoes a change which depreciates its value, while if you raise it while still sweet or if you heat it to its normal condition it approximates to the value of new milk.

Q. In the deep-setting to which you have referred, the cream is more bulky and requires more churning than in the shallow setting vessels ?—Yes, but it is less true as we improve the methods. Where we immerse the vessel in ice water, the cream rises mixed with milk. But by applying the water portion and cooling it more gradually, not down to the temperature of ice, but down to the temperature of cold water, it is purer. Still, there can be no objection for some milk remaining in the cream for churning. The little that remains does not add much to the labour of churning, for if you have a good churn, the labour of churning is of little account, although it would have been of account in the old system with the old dash churn. There is one advantage in having a little milk in the cream. I have noticed in churning Jersey milk, which is very rich, that when I undertook to separate the buttermilk from the milk, there was not enough liquid to carry it off, and the deficiency should be supplied with either milk or water. Again, milk added to the cream is a protection in churning to the grain of the butter. But the important qestion is, whether we get all the butter that we ought. If we raise the cream by a process that deceives us as to the real quantity of cream, that process is defective. It is therefore necessary that we should test any new system of setting the milk, so that we may know the real quantity of cream, that we may compare methods.

Q. The reason I ask that question is that I myself introduced a Cooley creamer into my dairy, and after using it two or three years, I threw it aside, because I found I had to churn double the quantity of cream and double as often, and it took double the time to churn it, as it took to churn the cream from shallow-setting pans ?—Did you ripen it long enough ?

Q. Yes, but even then it did not come as quickly as the cream from shallow-setting pans, and more than that, I found I did not obtain so much butter from my milk as I did by setting it in shallow pans. Of course the improvements you refer to design to guard against these defects ?—I know this, that in my part of the Eastern Townships, observing farmers have had the same experience. They have cast aside many of these, the first creamers introduced ; and yet some of them have retained them simply because of the saving of labour. With all the objections to them, they have been retained for that one reason. Now, it is desirable that that system should be perfected, if possible, so that we can get not only the advantage of saving labour, but the other advantages that should follow.

Q. Some people in my neighbourhood have retained that system, chiefly because their appliances for setting milk when it was open to the air were not good. Those farmers who had proper appliances have thrown aside the Cooley system. I must differ from you on the question of labour ; the total labour of getting the butter from the milk is greater with the Cooley system than with the other ?—I referred to milk-setting only. But in the improved system, there has been an improvement in churning also ; the labour of churning has been reduced to a minimum.

Q. In what way ?—Because the churn is so easily worked.

Q. What kind of churn is that ?—It is the revolving box, or barrel churn.

Mr. FISHER—That is what I use.

Mr. LYNCH—What is the diameter of your churn ?

Mr. FISHER—Two feet.

A. There is the difference ; the churn which forms a part of my outfit is from one foot to sixteen inches only, and is very easy to work.

By Mr. Allison (Hants) :

Q. What length of time is required to bring the butter with that churn ?—From twenty minutes to three-quarters of an hour.

By Mr. Fairbank :

Q. What temperature is the most favorable to produce cream ?—Sixty degrees on an average, is the most favourable. The milk should be set at a high tempera-

ture, and lowered to 60°; and it is desirable to carry on all subsequent operations as nearly as possible at that temperature. Milk-setting in open pans exposes a greater surface to the air, and allows the cream to ripen more thoroughly. By adopting some method of ripening the cream equally well in the deep-setting system, it would churn just as quickly as cream raised in the open system.

Q. How much importance do you attach to keeping the vessels clean and sweet?--I attach all importance to it.

By the Chairman:

Q. Is not Canada generally adapted for dairying to profit and advantage?—I think it is generally agreed that such is the case. In my visits through the different Provinces, I find a belief generally entertained that all the various localities are well adapted to dairying. Besides, it has been claimed by gentlemen who have visited us, by Professor Sheldon, of England, by Professors Arnold, Curtis, Harris Lewis, and Roberts, of the United States, that Canada is well suited for dairying. There may be small parts of the country not so favoured, but I am of opinion that it is generally as well adapted as any country can or need be.

By Mr. Trow:

Q. England excepted?—Not really excepted. Prince Edward Island, for instance, seems as well adapted as England.

By Mr. Watson:

Q. Have you ever been in the North-West?—I have not. I cannot speak of that country of personal knowledge, but I am disposed to say that there are parts of it well adapted for dairying.

By the Chairman:

Q. Have you any reason to believe that the people are disposed to take advantage of this adaptation?—I believe they are well disposed, and are even looking forward to dairying as a specialty.

Q. Are there any possible foreign markets for a large export from Canada of dairy products?—I think there are markets to which we have not yet exported, which might be opened, especially the West Indies and South America. I think these markets are all open to us, provided we set ourselves to meeting the conditions of transporting butter to those markets. The English market and other markets are open to us also, if we meet the conditions of such markets.

Q. What are the necessary conditions of securing to any country the lead in competition to foreign markets?—I think the conditions are that we cheapen the cost of production, that we improve the quality of the produce, and that we improve our marketing system.

Q. Are those equally important, and why?—I think that the improvement of the quality is of first importance—of more importance than any of the others, for the reason that the improvement of the quality will tend to meet some of the other conditions. At the present time, if we were to make our butter ever so cheaply we could not get enough for it, if it were of a bad quality, to cover the cost of production; but if we make it of first quality, though at the present price, there is so much poor butter going into the foreign markets that we would necessarily find a ready market for it. Then, the improvement in the quality, and the returns that would come from it, would lead our farmers to more enlightened methods, and that would give them the advantage of other competitors in the market, just as our Eastern Township farmers, by making dairying more of a specialty, had an advantage over Ontario. This would lead to the cheapening of the cost of production and would make the marketing of butter more profitable. So, for these reasons, quality is of the first importance.

Q. Do you think it possible for Canada to take the lead?—I do, for the reason, as I have already stated, that the butter made and exported from other countries is of an inferior quality. The butter made in the United States and exported is inferior. Their best butter is not exported. And this is true of most countries, except Denmark. There is so much poor butter placed upon the market that the country, which will improve the quality first, will get the run of the market, and it is as possible for

Canada to get it as for any other country. Already there is no country ahead of us in cheese making. This is the result of the co-operative system, which is adapted to that industry, and there is no reason why we should not advance in butter making to the same degree.

By Mr. Hesson:

Q. What do you estimate the loss to Canada in consequence of the turning out of bad butter?—It was estimated by the Ontario Bureau of Industries to be upwards of $3,000,000 for that Province alone. It may be estimated at $5,000,000 and the estimate still be reasonable, if we take all the facts into consideration. The quantity marketed in the Dominion might be largely increased and the value of the whole enhanced to the extent of not less than 5 cents per pound, and this result would make at least $5,000,000 difference in the industry.

By Mr. Trow:

Q. In order to improve the system as regards butter, is it not necessary to determine first just what the future of the industry will be—whether the butter will be made in the home dairy or in the factory?—I think not. That is just where has been one of our mistakes. A person whose observation is confined to one locality, who has not had the experience of the whole country, is disposed to localize everything. He says it is all in the grass or the stock, or in the lack of cleanliness, &c. One will say there is no hope because of the carelessness or laziness of farmers. Others will say that the creamery, or the factory, or the cream-gathering system, is going to make everything all right. When we make up our minds that such is going to be the case, we are working upon a false basis. The truer ground is to improve the industry at all points and remedy the defects; looking for any or all the different agencies to do their work.

Q. In what way will the desired improvement be brought about?—I think it may be brought about mainly by individual enterprise, mainly for the reason that so much depends upon the introduction of mechanical appliances.

By Mr. McNeill:

Q. Do you think there is much loss from the fact that the whole of the cream may not be extracted in the system as it is carried out in the private dairy?—No doubt there is considerable loss, but that is not the greatest loss. It is merely a matter of quantity. What remains in the milk has a certain value. The first cream that rises is the best, yet this is one of the incidental losses which might be corrected.

Q. What is the average amount of milk required for a pound of butter?—The average ought to be about 20 to 25 pounds, but, as a rule, the average quantity required is greater. It ranges from 25 to 30 pounds.

Q. Do you refer to the average obtained in private dairies or creameries?—Under any system we ought to get 1 pound in 25 or 27.

Q. I had some experiments very carefully conducted during the whole of last summer in the churning of the whole milk, and I found that from 40 gallons I received butter from 5 pounds to 6 pounds 2 ounces—5 pounds on an average. That is much more than 20 pounds of milk to 1 pound of butter?—It is a very good yield.

By Mr. Trow:

Q. By what agency may the dairying industry be improved?—Mainly by individual enterprise.

Q. What part may the Government legitimately take in the work of improvement?—I think the work the Government might do would be of an educational character. As things are, a great deal of educational work has to be done by private enterprise, and as a result it is done slowly. While private enterprise can introduce appliances better than the Government can, Government can do educational work better than private enterprise. The Provincial Governments have been doing this sort of work. The Ontario Government for ten years has been improving the dairy interests, the cheese industry especially, by an effort in that direction.

Q. Do you think it is the duty of the Federal or the Local Governments to take this question up?—Both should have something to do in this matter.

Q. How would you seperate their various jurisdictions?—There is work which the Dominion Government could do for all the Provinces, and there are certain reasons why they could do it. In the first place, it would insure its being done. One Province might do certain work, another might not do it on the ground that it has not the means. I have letters from Ministers in two Provincial Governments who have a strong disposition to do a certain work; but the question of means has arisen, and they do not know whether they will be able to manage it or not. Then again, the Dominion Government can do once for all the work that would cost each Province individually just as much to do. The Dominion could spread the work throughout all the Provinces, and if the Dominion Government did work of that character the Provinces would have plenty outside of that to do to meet their own peculiar Local conditions.

By Mr. Hesson:

Q. Can you give us some idea what you think they should do?—My idea is that, in connection with the Department of Agriculture there might be a special Bureau for the dairy industry. I base my suggestion in that regard upon what has been done in an imperfect way but with great satisfaction by the Provincial Governments already. In the Province of Quebec there is a Dairymens' Association which has sprung out of the necessities of the case. There existed already a Council of Arts and Agriculture. This Council met the wants of general agriculture, but the needs of the dairy industry which grew up as a new industry, created a demand for the Dairymens' Association. The Government practically recognizes this Association as having an advisory position; it takes suggestions from the Association and acts upon them. A Bureau having this particular work in view—the furtherance of this industry as a special branch of Agriculture—would accomplish much good. One work would be the encouragement of those excellent agencies—the Dairymens' Conventions. There have been very successful Conventions in Ontario, but they have been held at undue cost, and there have been too few of them. There have been only two Conventions held, one at each end of the Province, each year. In the immediate vicinity of these Conventions great good is done, but there would be a greater good done if there were a larger number of these Conventions. At the present cost of these Conventions, it would not be practicable to think of having a large number of them. But if they could be managed on a systematic plan, their cost might be reduced. A number of Professors are now engaged annually to come from the States to these Conventions. They must be paid a large amount for time and travelling expenses. Then a report is published for a few members comparatively—a few hundred copies. All this requires a comparatively large outlay for the object sought to be accomplished. The sum allotted to each Convention is $1,500 a year. If the number of Conventions were increased the cost of each Convention would be far less. I would propose that the General Government give a grant of $100 to each Association that would have a membership of not less than one hundred persons, and would hold an annual Convention. The membership fee should not be less than 50 cents each year. The Government should furnish each Convention with a lecturer who would be connected with the Bureau, also a short-hand writer, so that the reports of the meeting could be preserved. The cost of this furnishing would be comparatively small, because these officers would be engaged by the year, and would acquire an experience that would make them excellent specialists. The reports might be kept preserved in the Bureau and they would form most valuable matter in connection with the Bureau, matter more valuable than could be got any other way. As it is now, the report of our Dairymens' Convention are extremely valuable. They are looked upon by the American Professors who come here as of great importance. But in a measure they are wasted; they are thrown around among a few people and are ill-digested. All these reports could be summarized and a digest of the whole sent to each member of an Association throughout the Dominion. By this mean salone such an impetus might be given to the dairying as would alone suffice in time to give Canada the lead in this

industry. I think my position is well based, for I have attended all the Conventions that have been held during the past three years, and can speak from experience as to their value. I have recently organized one Association which is now on a permanent basis and promises to be a success. Professors from the United States who have been at our Conventions have assured us that the meetings have been remarkably good. But at the undue cost which now attends the holding of these Conventions their general introduction must be very slow, whereas with a little Government aid, they would be made everywhere a permanent feature of the locality. I would also suggest the establishment of a model creamery, where experimental work could be done, so that if any locality wanted to establish a creamery or butter factory they would know where to go to get the information needed.

By Mr. Cochrane:

Q. Might not these Conventions be made useful to other branches of agricultural industries, as well as to dairying?—Yes; these Conventions take up all the general features of agriculture. They take into consideration the cultivation of the land, improvement of stock, ensilage, soiling, &c. These matters, so intimately connected with the success of the dairying industry, are made subjects of investigation and discussion at the Conventions, and all intelligent farmers are stimulated by the papers which are prepared and read by the specialists at these gatherings. No one who has attended a few Conventions would under-estimate their value.

By Mr. Trow:

Q. You are of opinion that very good results from these Conventions would be ensured with a trifling outlay, and would be the means of doing great good—that the result would be commensurate with the cost?—When I remember that Ontario has for ten years had two annual Conventions, and has published annual reports of the discussions at these Conventions, all of which has spread a great deal of valuable information throughout the country, and has contributed largely to the marvellous progress of the cheese industry in that Province, and that all this has been accomplished at an expenditure of an amount that it would cost to build only a single mile of railway across a prairie, I think the results are fully commensurate with the cost.

Q. You are the author of a work entitled "Scientific Butter Making," are you not?—I am.

Q. Has that work been extensively published?—It was published by the Ontario Government for free distribution in Ontario.

Q. What number of copies did they issue?—They published 10,000 copies.

Q. Do you know if they intend to distribute it more extensively?—I learn that the edition has run out. I know that there is a large demand for the book, for I have letters from many persons asking for it. The Province of Quebec intends to publish a revision of the work for distribution in that Province, and the issue of it by several other Provinces is simply a question of means. In one case it has been approved of by the Department of Education. The question of means always comes up, which shows that there may be a disposition on the part of a Province to do this work, but it may be prevented owing to the expense.

By Mr. Hesson:

Q. What is the cost of publishing this book?—I have no knowledge of the cost. But if each Province separately publishes small editions two or three times over, the cost will be far above what it would be if the book were published once for all by the Dominion, in the best form possible. In this way the cost would be comparatively very small indeed.

Q. Is not the book too large for the ordinary butter maker to take it all in?—It would be if it were not arranged so that one may find in the first twelve pages practical directions for the whole process.

By Mr. McCraney:

Q. I would like to know how we could obtain copies of that pamphlet. I have had quite a number of applications from parties who are anxious to secure copies, but could not obtain them in any way. Another question I would like to ask while I am

on my feet, which may not be considered quite relevent to the question under discussion, but still has an important bearing on it, and that is as to the value of our mineral phosphates, and their use on our meadows and pastures. Is it advisable to export them out of the country as they are being exported?—As to the first part of your question, I know no way of procuring copies of this pamphlet at present. I wanted a few copies for myself, but I was informed by Hon. Mr. Ross, Treasurer of Ontario, that he could not spare me any. With regard to the last part of the question, I would only say, that in giving my evidence here, I aim at stating only what I know and can speak upon, from a good basis of knowledge, experience and osbervation. You have asked me now a question that I am quite ready to admit I am unable to answer.

Mr. Ferguson:

Q. You think the chief means to be used in improving the quality of our product is to educate individual dairymen, and a little later on you mention the high position that our cheese products have obtained in the British market, owing largely to the co-operative plan. Now, I am of opinion, and I would like to ascertain your views on it, that the education of the people in the butter making business could, at a more early period, be accomplished by the co-operative plan. I think the various means of improving butter on scientific principles could be more readily and quickly brought about, so that eventually individuals would be able to observe and learn from the co-operative methods so as to fit them for producing a perfect sample in the private dairy. Is it not your opinion that it would be advisable to encourage the co-operative system of making butter as early and rapidly as possible, in view of the character of the product as a successful educational influence?—I am still of the mind that I was when I said that I would enconrage all the agencies. I would not look to one to accomplish the whole. When we remember that there are twice as many pounds of cheese made in the home dairies in the United States as there are of butter in the creamery proper, we find that the establishment of creameries is very slow, and it is difficult to force them on. There are local conditions which always affect the success of these things. We cannot theorize and make them go—they will only go of themselves, and the inevitable result will be that the private dairy will continue to exist to a preponderating extent. We should set our energies towards improving in all directions, and by some systematized plan whereby the Dominion Government will do its work, and the Provincial Governments will do their work, through an organized Bureau, and through all possible agencies, there will be furnished to our cheese factories and our butter factories, that great desideratum of to-day—skilled labour—that will improve the factories, the home industry, and our marketing system as well. It is not so much the Fairlamb system of cream-gathering, or any other particular system, that is to improve our dairy, but it is the application of our energies towards educating the people up to take full advantage of the adaptation to this industry of scientific methods, and I think this can be best be done with the aid of a Bureau such as I suggest, under official sanction. Dr. Sturtevent, of the New York Experimental Station, referring to this subject, said that a country which is adapted to dairying should make great efforts by enlisting the assistance of the Government, and remedying all defects so far as possible, to put its dairying industry on the best possible basis, and having once secured the lead of other countries in this respect, it would not be difficult to retain it. So, if we do not take the best advantage of our opportunities, some other country will; it is only a question of time. When we consider that the cost of doing this is a matter of very little moment, I think there should be no question in the mind of the Committee as to the immediate necessity of some such action. I would say this, too, that no action by the Government in any other direction could be more popular, or would be more generally approved by the country.

Q. The point I wish to get at is this: that the creameries could be more immediately reached in this educational work, than the butter makers?—Allow me to say one thing; if you will introduce good methods at once into the private dairies, as the results show themselves, you can go to the private dairies all over the country and get

from them capable workers for our creameries. But to-day there are very many localities—and I have an instance of that in the County of Westmoreland, New Brunswick—where there has been a disposition to start a creamery and the scheme has come to a standstill, because they could not get a capable man to take charge of it. I have had propositions time and again to give my services towards starting and running such a creamery. If we have the advantage of a model creamery, where the people can go and learn, so that their instruction will be of advantage to them in following out a similar system in the private dairies, it will do an immense amount of good. But if you expect creameries to advance without some action being taken to train operatives for those establishments, there will be disappointment. Recently, a gentleman owning a large cheese factory which is now lying idle, told me that he was very anxious to get a man; that he had advertised in the *Globe* for a man capable of running his factory as a creamery, but so far he had not obtained one. Now, I find that so long as the creameries continue to have a different system from that of the private dairies, there will be the difficulty in getting suitable workers; but if the systems were made uniform, this difficulty would be largely removed.

Q. You would commence in the private dairies to educate?—I would commence in both.

Q. You talked of using the private dairy as a school to produce good operatives for the co-operative dairy. My idea is to commence with the co-operative dairy so as educate them for the private dairy?—We have commenced in the co-operative dairy, and we have neglected the private dairy—the co-operative dairy has had its chance. Now, my idea is to neglect neither agency.

By Mr. Cochrane:

Q. I understood you to say that a person should have two dishes to hold the cream in?—I said that the cream of each churning, made up of different skimmings, should all be kept in one vessel, not in different vessels. It should all be kept in one lot, to secure its uniform ripeness.

Q. Then you would suggest that the cream should be a certain number of hours old before churning it?—Yes.

By Mr. McCraney:

Q. Perhaps Professor Arnold, who is present, would not object to give us his views as to the value of phosphates?

PROFFESOR ARNOLD.—Phosphates are extremely valuable as fertilizing material, but it is not always best that they should be used alone. They are one of the elements that we need to apply to the soil—they supply the nitrogenous constituents, but we want potash also. Upon pastures phosphates are very valuable alone—that is mineral phosphates, not too finely ground and scattered over the field. They decompose gradually and give off a portion of phosphoric acid which is consumed immediately. Phosphates are more especially valuable for maintaining meadows and pastures, and on dairy farms they may be used with advantage.

By Mr. Cochrane:

Q. How do they affect fodder for cattle?—They are not so good.

By Mr. McCraney:

Q What is the relative value between bone dust and phosphates?—They are both the same; it is difficult to discover any difference in their value.

The Committee then adjourned.

OTTAWA, 3rd March, 1884.

The Committee met, and continued the examinatian of MR. LYNCH.

By the Chairman:

Q. What are your reasons for believing that the Canadian people are favourably disposed towards this comparatively new industry as a profitable specialty?—I base my opinion, first, upon the action of different Provincial Governments, and the general approval of the people in regard to that action. The interest in this question was

well shown at the Dominion Exhibition (at St. John, N.B.), last fall. On that occasion, a dry goods firm took advantage of the known interest existing in the Maritime Provinces on this question, to bring out Professor Sheldon, from England, to exhibit a working dairy at the Exhibition, and to lecture on the subject. The object of the firm was avowedly largely to advertise their business. Professor Sheldon was brought out at considerable expense, and he did a great deal to increase the interest in the subject, and imparted some information to the people in reference to it. It did good to the public, but the object of the effort was simply to advertise a dry goods business. Then I might say that the demand for the work on scientific butter making, which was published by the Ontario Government, is such as to show that the people are pleased with such action. The work itself has received a generally favourable reception from all classes.

Q. Why may not individual enterprise accomplish all that is necessary without any Government action?—Because of the existing state of things. From the way this work has been conducted in the past, there is an indisposition on the part of the people to accept novelties, lest they be humbugged, to speak plainly. They have been humbugged a great deal in the past, when they showed a disposition to get everything new that would help them. Now, this state of things must be overcome by a great deal of work, and the want of knowledge on this subject can be supplied much better by the Government and much more quickly, than by private enterprise. Besides, it is a thing that private enterprise ought not to be asked to do. I might give you statements from leading men in Toronto and Montreal—members of the Board of Trade and Corn Exchange, and commission merchants—showing the disposition of the trade on this question. In the butter book referred to, there is a copy of a petition that was signed by the leading men in Toronto, and I could give a letter signed by the leading commission merchants in Montreal, all testifying that the butter and cheese industry show great need of educational work to overcome this diffiulty. I think it will hardly be questioned that it is not for private enterprise to do all this work. Government can do a little, which will go much further than all that private enterprise can do, and the two combined will serve, doubtless, to revolutionize this industry. I am thoroughly convinced of that.

Q. Do you think inspection will meet the necessities of the case?—I think not. Inspection is only one of the remedies. Without the quality of the article being generally good, or in other words, if the quality were generally bad, inspection could do very little. Butter is a peculiar article. It is not like corn or flour. It may be good to-day and not to-morrow. It is impossible, as butter is made and packed to-day, to inspect it and put a brand upon it, and know that after a further lapse of time the butter will be just as it was when branded. It is impossible for butter buyers to go into the cellars, pick up the butter as it is lying there, and ship it, subject to all the contingencies to which it is liable in transportation, and know what that butter will be when it reaches the consumer. But if the process of butter making were conducted on scientific principles, if the packing of butter were what it ought to be, then inspection would do more good than it would do now. Yet, it would do some good even now. It might do a great deal of good in regard to ladle-packed butter; that is, butter bought by country dealers in small quantities, mixed together, and put upon the market. It might help to correct that, but it could only help. It can be one of the helps which may be adoped to cure the evil. Inspection would be a part, also, of an improved marketing system, but it would be only a help.

Q. Do you think there is any problem before our agriculturists upon which the dairy industry has a bearing?—Yes, I do. The problem is this: Our lands in the eastern Provinces have been undergoing a process of deterioration. The people have now found out that the land was not what it was before. I know in our Eastern Townships this has been the case, and the question was brought up by a leading gentleman there during a late Convention, and put very forcibly before the meeting, as one of the principal evils in connection with agriculture. It was stated that the farmers have been doing pretty well, have been making money, but they have put their money into mortgages or the banks and allowed their farms to deteriorate.

The young men start out on the farms, but they find that they are not able to do just what the older ones have done, on account on the changed conditions, and so they leave the farm. There is no question but that the conditions of farming have changed, and that new factors have come in to disturb the old state of things. Butter making, that was once purely a local industry, is now looked upon as a possibly larger special industry, and there is a disposition on the part of the people to take advantage of the fact. They see that they cannot grow grain alone, as they did before; they must do something to improve the quality of their land and bring it back to its original heart. They cannot hope to raise stock alone to good advantage, for though they may raise stock well to-day, the enormous future competition, both in grain-growing and in stock-raising in the opening North-West, will change the character of that industry, and so they are looking to mixed farming. Of all the different branches of smaller farming, or mixed farming, dairying seems to be one of the most important and the most profitable, on a large scale. It will not do to take up one branch exclusively. If it were cheese making, for instance, there would be the necessity to come back to butter making, to equalize things after the over-production in cheese making. If butter making is made a specialty, the necessity for improved quality is more than ever evident, owing to the new and disturbing factor of the artificial products.

By Mr. Trow:

Q. Do you anticipate any over-production?—No; I think Professor Arnold said here that things will tend to equalize themselves. But that simply goes to prove that we cannot engage exclusively in cheese making. Now, if we go into butter making extensively and make an article of inferior quality, what will be the result? When it goes into the English market it comes in competition with artificial butter, and that at once complicates matters. Here is another factor in the problem—this artificial butter can be made freshly as required, and if the real butter is old and at all rancid, or in any way defective, the artificial butter takes precedence over the real article. The problem is, should farmers alter their system of exclusive grain-growing, or exclusive stock-raising, to mixed farming. In mixed farming this butter making industry becomes a very important one, and profitable butter making on a large scale is not possible unless the quality of the article be improved. And so I say this is a problem before the farmers of the country; but that problem may be met in a simple and easy way, in a large measure, at least, by first improving the quality of the dairy produce and then increasing the production to the necessary extent.

By the Chairman:

Q. You spoke of cheapening the cost of production; how can that be accomplished?—There are many ways in which farmers may very readily and quickly change their mode of farming, or make it assist in cheapening the cost of producing. Take, for instance, their manner of saving the fertilizers necessary to be applied to the soil to restore the elements that are taken from it in cropping. There is a great waste to-day in that regard; so much so, that in many instances I believe it makes all the difference between profitable and unprofitable farming. And this need not be. A little work on the part of each farmer, about his stable, making perhaps a rough shed or some cheap protection of that kind, will help to save all this fertilizing material. There are many farmers in the country who spend a whole day in bringing to market a small jag of hay, or a little load of bark, or some other small marketable product, and they really get little more for it than pays for their time in taking it to market. If that time were spent upon improving their barns and stables, and making arrangements for the saving of everything of a fertilizing character, it would be like money invested at compound interest as compared with the present use of their time. This would probably be done, if the farmers were instructed in the importance of the thing, if they knew how much good would be realized from the adoption of these improved methods. Another way of cheapening cost of production is to improve the stock, which can be done by selection and breeding. It is not fully realized yet by the farmer how much he loses by not properly selecting his stock. If he would take the trouble, once in a while, if it was only for a week at a

time, of weighing the milk from his cows, and then if he would adopt the practice of testing separately the value of each cow's milk, and would also weigh the animal and food given to it, he would then be able to determine the value of his various animals, and know how to select from them, to keep the best, and dispose of the inferior animals. As a matter of fact, farmers often sell off their best stock because they do not know which really is the best, and sometimes for the poor reason that they can get a few dollars more for the better animal than for the inferior one. In the way indicated, their stock would always be kept up to a high standard, and the business would be much more profitable. It has been computed by good authorities, in the States and also in Canada, that one-third of the milch cows of the country are kept at a loss; another third just about pay expenses, while the remaining third has to make up the loss that results on the first third, as well as give all the profit there is in dairying. Now, this need not be, because a little attention on the part of the farmers to improve their stock would remove much of the difficulty. The next point is the matter of feeding. Not only should we feed regularly and liberally, but we should feed well-balanced food—that kind of food which will go the farthest in preparing the article that the farmer is producing. I have known farmers who are supposed to be very intelligent men, and who kept fancy stock, to feed Jersey milk to their calves. Now, there can be no advantage in feeding such rich milk to calves, because it is well known that while Jersey milk is really too rich for this purpose, cheaper food would be better. Butter in any form is too expensive a food to feed to calves. When we consider that even whey can by the addition of an inexpensive article be made quite a valuable food, we can understand how much more profitable it would be to first manufacture butter or cheese from the milk, and then feed the residue to the calves. In addition to the matter of feed, there is the other question of shelter. Many farmers have a practice of keeping their cattle in cold stables, and turning them out to drink cold water, and they forget that all this cold must be made up by an extra amount of food to supply the necessary animal heat. This state of things must be provided against by artificial means. There may be improvement in the direction of cheapening the cost of production, also, by better tillage, by keeping up the quality of the land, by the improvement of permanent pastures, and by growing succulent food for the summer, instead of leaving the cattle on dried-up pasture only half fed; and, lastly, I would refer to better methods of manufacture. Not only can we get a better quality by the improved methods, but we also get a larger quantity. In the matter of raising the cream from the milk, the quantity, as well as the fineness of the grain and quality, depend upon the methods adopted. Artificial means may be taken to counteract the varying influences of temperature, and even defects in the milk, owing to scant pasture and too much hot sun. Many defects can be remedied by artificial means. There are many other ways of remedying the existing state of things which I have not touched upon, and by their adoption the farmer may without any particular outlay, except a little time, by the application of a little intelligence, lessen materially the cost of production. I would not have the farmer think that these methods are designed to reduce the prices of his commodities. That is not the point. If he can make a better quality and keep prices up, all the better, but even then let him make the cost of production as low as possible, and then when we develop our trade and come into competition with a foreign market, we shall be able to hold our own against all others.

By Mr. Trow:

Q. You speak of exposure to the sun. Would you advise the culture of shade trees in pastures?—Yes; by all means.

By the Chairman:

Q. What are the defects of the present system of marketing, and how are they to be remedied?—With most manufacturers there is a connection kept up between the producer and the consumer. This is especially true where the manfacturer desires to build up a reputation, and all manufacturers know that for a permanent and profitable business, a good reputation is most desirable. The manufacturer knows that it will help the sales, and it has such force that it will stand him in good

stead even after his goods may have become less valuable. Now, in no ordinary case is it so important that the connection be kept up between the producer and the consumer as in this matter of dairying, and especially in butter making. Butter eaters look upon butter as a luxury and not as a necessary food, and if the quality is good they eat more of it than if it is bad. It is universally the case, that where butter is hard to find of good quality, that when one does get a good article he is very anxious to get more of the same kind. In the butter market we have frequent illustrations of this, and I do not think I need waste time in giving them. As a matter of fact, most people who eat butter to-day, when they get an article of good quality and want to get duplicate packages of the same sort, find it almost impossible to do so. The practice in private dairies, even at the best, is to scracth the name of the maker with a pencil upon the cover of the package. That cover may be changed to another package, or the name may be obliterated, and when the butter gets into the hands of the dealer, there is an end of tracing the maker of it. The dealer thus keeps no trace of the producer; he perhaps, does not even know in what town it is made. This is one of the principal defects in the marketing system, and it is a defect that lies largely in the power of the trade to correct, though a great deal lies with the farmer himself. There is much need for improvement in this respect. I was asked by a leading farmer in our Eastern Townships one day, to tell him where was the use in making an effort to keep up the market quality of the butter under present conditions. He said he could get no more for his good butter than his neighbours got for their poor article. I told him I thought the difficulty lay largely with the farmers themselves; that when a dealer came along to buy their butter, and examined it in the cellars, it was very difficult for him to tell the real quality of that butter; that is to say, its quality in view of its future. The appearance of the butter, as he saw it in the cellars, would not be an absolute guide, and it was impossible for the buyer to pay a very much higher price for one quality of butter over another, before it had been tested in the market. I pointed out to this farmer, that this was a matter which they could correct themselves, by putting a brand upon all their good butter. If a number of them combined together, and manufactured nothing but a first-class article of butter, each maker could put his name or some particular brand upon his package, which would be known in the market, and which would be a guarantee of its good quality. Or a number of farmers could unite together, and let their butter be known under some particular brand or name, which would be common to all and include the whole. Then they could go to the butter dealer and tell him that they would guarantee the quality of their butter; that they would stand behind it wherever it went. They should ask him not to lump it in with the general shipments of butter, but to send it to the market, and to remember, that if the butter turned out satisfactory in the market, they could supply him with more of the same kind. This is a simple and easy arrangement which the farmers in any progressive district could carry out. They would receive no more, perhaps, for the first shipment, but the moment the quality of the butter was known it would create a demand for itself, which must be satisfied, even though the buyers had to pay a larger price. In this and other ways, the farmers, invidually and collectively, can do a great deal to secure justice for themselves. This is a simple illustration of some of the ways in which this marketing system can be improved. By having an improved quality we make it possible to improve the marketing system, and to introduce other improved methods, such as inspection, which has been alluded to, and to make it possible to secure for this large and important industry a much higher place among the industries of the country than it at present enjoys.

By Mr. Hesson:

Q. What guarantee would the maker have that his brand would not be violated or immitated by others who are making butter, and who would make an inferior article?—The brand of a good maker might be infringed upon after a time, but there are reliable dealers who could not afford to do such a thing as it would be against their own interest. The connection between the producer and the consumer is very close, at least until the shipment is made to Europe, and there is not much opportunity for

frauds of this kind. I suppose we may say that there is only one go-between on this side of the water.

Q. But might it not occur in the hands of the producer, who might make up a package, or a lot of packages, of butter and brand them as Mr. so-and-so's butter?—If the farmer would carry that too far, and put in what he knew to be inferior butter——

Q. But I mean the dealer, the country storekeeper, after the butter comes into his hands?—

MR. SPROULE.—Would not that be likely to work both ways. If bad butter makers should spoil the market they would derive no benefit from it themselves?

MR. LYNCH.—Yes; it is not in the interest of the butter maker to do that. Everything points to it being in the interest of the butter maker to improve the marketing system. I do not think this is going to do everything, but I think that by our trying to do what we can do, and the Government doing what it can do, by way of education and carrying out such suggestions as have been made; by the help of all these agencies working together, I say I am hopeful that all defects may be remedied and that we will attain to what we desire. The butter trade is of such a character to day that the dealers in the cities tell us that we have no butter trade. They are not hopeful, and I may say that butter dealers, in the past, have lost a great deal of money owing to these disturbing factors referred to. The time was, when they could ship butter and hold their own on it as a commercial transaction, and in some cases make a little profit out of it; but to-day, or rather during the past few years, when they have shipped butter according to the usual way, they have found that owing to these changed conditions, their butter has been kept on the market until they have had to sell it at a great loss, at so low a price as from 7 to 9 cents a pound, quoting from some of the circulars of leading merchants.

By Mr. Cochrane:

Q How many cows had this leading farmer, to whom you referred a few minutes ago, in his dairy?—I should suppose him to have, according to the average in his part of the country, from ten to twenty-five cows.

By Mr. Hesson:

Q. I am afraid that so long as the country storekeepers handle their butter as they do, you will not improve the quality very much. They buy their butter in small lots, and it is thrown together in their cellars without much distinction as to quality, and the good butter maker does not get fair play. I refer your remedy is not sufficient?—I will not claim that it is all-sufficient. I only claim that it goes in some measure towards helping to avoid the difficulty, and that it ought not to rest with one or two, or three, methods of improvement, but that every suggestion in that direction which is found to be practicable should be acted upon. I am quite hopeful that all the difficulties will be met. I do not know what weight you will place upon my hopefulness, but I may say that I have for three years been brought face to face, perhaps, with all the difficulties, local or general, in all the Provinces, excepting in Manitoba and westward, and I see no means, in my own mind, by which, with Government aid acting in its own peculiar sphere, and by the energy of the trade acting in self-interest, and by the efforts of the farmers, who are awakening to the need of something being done, these difficulties may all be overcome. To illustrate what may be done to correct the difficulty which was spoken of in the last question, we find that wherever a farmer can be induced to make up a whole package of butter before marketing, we do not experience the same difficulty, because where there is a certain amount of butter manufactured and placed in full tubs, there is something to induce the dealer to send out buyers. Suppose a farmer has four or five tubs filled with a uniform quality of butter in his cellar, it would be an object for the dealer to visit him. In this way, perhaps, several buyers come into competition, and the highest price is paid for the article. Let each farmer, or a combination of farmers, secure a particular trade mark, and even have it registered if necessary, then a package of butter so branded can be traced, and it will be known whether the butter has proved satisfactory or not to the consumer. All these things may be made to work

together, and the improved system should be brought to such a state that it will pay to introduce mechanical appliances even on a farm where only one cow is kept, so that in such an extreme case as that, the butter could be held over until a tub can be packed at a time. This would go a long way towards remedying the difficulty which you find more in Ontario than we do in Quebec, and which exists more in the Maritime Provinces than in Quebec. When we speak without hope about this thing, we forget that many of these leading difficulties may be remedied; we should not base our anticipations of it upon what exists at present, but upon a possible improved state of things. I only offer these as suggestions; but, as I have said before, there ought to be from this Committee and from the farmers, and from dealers, interest enough manifested, all bearing in the one direction, so that combined action may be taken on the part of all to remedy the defects of the past and improve the trade for the future.

By Mr. Trow:

Q. A trade mark may be very well for a man who keeps fifteen, or twenty, or perhaps fifty cows, but how about the man who has only a small dairy?—I refer to the trade mark of a combination of farmers in a district. Each farmer has his name upon his own packages, and all these packages are then branded with one trade mark, so that when they are shipped to the dealer, the trade mark says, in effect, that these farmers stand behind their own butter and guarantee its quality. The labour and cost of branding is very slight compared with the advantages to be derived from it.

Q. How would you prevent country merchants from purchasing from every old bachelor or old maid, who have one or two cows, and who would skin a flea that fell into the milk, almost, to get a drop of cream to add to the quantity, regardless of the quality?—The losses which the dealer will meet with in competition with those larger shipments, would soon bring him to his senses, if nothing else will do it. Self interest will cure him.

By Mr. Cochrane:

Q. Do not you think that if the Government were to assist in this matter and adopt appliances, to send a lecturer over the country to lecture in each county, accompanied by improved implements and plans for manufacturing butter, they might do a great deal of good by making known the best methods of butter making?—I can prove that that course would be highly beneficial. At one time I was rather disposed to think that the lecturing system would not amount to much. In fact, when one or two of the Provincial Governments intimated to me that, in connection with my agitation in bringing the dairying industry more prominently before the country, they would like to have lectures on the subject, I was rather opposed to the plan. I thought there were better plans, and though I did not doubt that much good might be done by the introduction of the improved mechanical appliances, I thought there was a difficulty in the way of a lecturer under the Government bringing these appliances before the people. At that time, I did not think there was any advantage to be gained from lecturers, but after Prof. Sheldon came out to St. John, I, myself, was invited up to New Brunswick, and also to Prince Edward Island, and in speaking there, and explaining something about the methods of improved dairy work, I had undeniable proofs of the success of the lecturing system. Those lectures were generally given without the exhibition of appliances of any kind, and they were given entirely at my own expense. I have also given public addresses on the subject on one or two occasions in my own district, and the result of one particular lecture was the recent formation of a Dairymen's Association, which has just had a very successful meeting at Richmond. All these results prove to my mind the benefits to be derived from lectures. I would look upon lectures rather as one of the details of the work to be carried on by the Government, through the proposed Bureau, under the control of the Agricultural Department. There could be qualified lecturers, who would be capable of making official tests of the different appliances submitted to them for approval, and these appliances could be exhibited by the lecturers to the farming community without there being any suspicion attached to them as being influenced at all by motives of self interest in recommending any particular machine. In this

way, we would have brought before the people in an official and perfectly unbiased manner, the results of carefully conducted tests of different appliances, and these would be illustrated by a sort of object-teaching, which would be far more effective than a mere lecture. Very much of the difficulty in the way of private lecturing, and exhibition of appliances, consists in the fact that the lecturer is supposed or known to have a financial interest in the appliances he exhibits. I do not understand how any lecturer, or worker, or professional man, who wishes to do a legitimate work, can succeed, knowing his statements will be discounted. The only way to do it properly, in my mind, is for the Government to have a Bureau, or some official organization, where the merits of all the different methods and appliances can be tested and determined upon, and the results made known to the public by lectures and exhibitions. Under Government control, these two branches of the work may be combined so as to do effective service.

By Mr. Trow:

Q. Are you aware that a few years ago there was a prejudice existing in the minds of many people in Ontario against our Canadian salt. Was that justified or otherwise, and what is your opinion of our home salt? I find it very difficult to determine that matter for myself. Among the dealers, I find one who says that such-and-such salt is the best, and he claims it by virtue of the fact that the butter or cheese in which it is used stands best in the market. Another dealer says that another kind of salt is the best. After some time, I found that there was an influence under these opinions; that in some cases these dealers specially favored one or another brand of salt over other brands, because they were interested in the sale of it. I have come to the conclusion that we may get good salt of Canadian make if it has been manufactured properly. As the salt appears at present in the market, I am unable to state, from my own experience, anything very definite as to its relative qualities.

Q. You think that if our Canadian salt was made sufficiently pure it would be of good enough quality?—I think it can be made so. On this point I think valuable information should be procured by a series of a practical tests. In judging salt in the ordinary way, a little difficulty comes in, for the doubtful quality of the dairy product may be owing to improper methods of manufacture rather than to the salt. We know this, however, that if the salt is pure there are several ways of demonstrating its purity, and I think it is very desirable that that fact should be determined by official, unbiased tests, so that you could tell the people which kind of salt is best. It will not do for me, as the inventor of one sort of implements, or a dealer in any particular brand of salt, to give evidence before the people which is to be decisive, but an official Bureau, where no undue influences are allowed to interfere, can determine these things satisfactorily.

Q. I suppose you are aware that our Goderich salt, when exhibited in Paris and Philadelphia, took the first prize against foreign salts?—I was not aware of the fact.

By Mr. Farrow:

Q. Are you aware that our salt stands the test with all other salts, especially in its value for salting cheese?—I am aware of this; but I have had very well supported claims made to me by dealers in butter and cheese as to the qualities of many different grades of salt. For myself, I am not in a position to determine for one or for the other.

Q. There was a test made about four years ago in the County of Huron of the value of different kinds of salt in preserving cheese, and it was proved that cheese salted by Goderich salt stood the test better than any other?—It is very gratifying to know that. Just as I stated in the beginning, after I had heard the statements of a number of dealers in support of certain brands of salt, and learned that they were interested in those special brands that they recommended, I felt unable—though I would have been glad to do it—to give you any definite or authentic opinion of my own on the subject. I was not aware before of the important facts that have just been given to show the actual superiority of our own salt. Our people ought to know these facts.

By the Chairman:

Q. You estimate the annual loss to the country through imperfect methods of butter making at $5,000,000. In what way do you arrive at that estimate?—There are several ways in which that estimate can be made, and the ordinary way, I suppose, would be something like this; 50,000,000 lb. of butter, not necessarily for export, change hands each year. The average price of that butter at present, might be said to be 15 cents. If it were all of good quality it would sell for 25 cents, and the difference of 10 cents per pound on the lot would make $5,000,000. That does not represent that we draw $5,000,000 more into the country; it represents $5,000,000 more of value in what we sell. But I consider that while that calculation might be questioned in some ways, there are other factors which go to show that it has a good basis. While at present 50,000,000 lbs. of butter change hands annually, that trade might easily be doubled if a good article were made, and in that case we would have to add but 5 cents per lb. to make the gain of $5,000,000 to the country annually, when we consider that we export nearly $7,000,000 worth of cheese per year, and remember that if our cheese industry were just what our butter industry is to-day, we would be exporting, if any, perhaps not $2,000,000 worth, we can see how a development in this industry becomes possible under proper conditions. There is no question at all that Canada might just as well export a large quantity of butter as well as cheese—perhaps 50,000,000 lbs. annually, perhaps 100,000,000 lbs.—It is impossible for me to say exactly how much—which might realize a value to the country of $5,000,000 per annum. Some people tell me that that estimate is large, and that I am inclined to be somewhat visionary, but I look back upon the result of developments in cheese making, and in looking forward to the possibilities of the butter trade, I take this into account, and with rather hopeful spectacles, I say that a position may be attained which will mean to us a difference of at least $5,000,000.

Q. Of course you do not undertake to say that this increase in price will make an actual gain to the farmers of the country of this amount?—Yes; it would seem to add so much value to the production.

Q. I think the point Mr. Lynch has made, that it would increase our status in the foreign market, is a very strong one?—I would say that with an improved quality of butter, while the farmer gets 10 cents per lb. extra, the man who buys the butter is quite willing to pay that additional price for the better article. It is value to him, and the indirect result would be, in my opinion, an added value to the export trade of the country of at least $5,000,000.

By Mr. Cochrane:

Q. You can go farther than that. If I add 10 or 20 per cent. to my profits, I can add that much to my luxuries?—Yes; undoubtedly.

By Mr. Hickey:

Q. Does not this oleomargarine tend greatly to keep the importations of foreign goods out? It is so finely made that it can be manufactured at a much less price than butter can be made for?—That is just the point that I have tried to bring out. If our butter is of a superior quality it will sell in preference to the artificial product.

Q. But the price is too great?—No, I think not. I think the farmer, by cheapening the cost of production, is going to be able to compete in price with the artificial product, because, other things being equal, it has been claimed by very good authorities—and it is a very reasonable claim—that butter ought to be manufactured from the milk cheaper than by killing the animal. Then, the manufacture of this artificial product by the slaughter of animals is limited.

Q. But the animal is slaughtered already for human sustenance. That is what makes it so very cheap?—At the same time, if they could not get a relatively good price for the artificial product there would be no advantage in utilizing the animal for that purpose, and it has been proved that butter may be produced at a much cheaper rate than now. By so doing, the butter maker will be able to compete on equal terms, if not at an advantage, with the producer of artificial butter. But so long as the quality of the butter remains bad, just so long will that butter be thrown

right back upon the dealer, and kept back, and being bad, it is one of those things which gets bad by an accelerated force, and when it comes to be put upon the market, as it must at last, it is unfit for purposes of ordinary consumption.

By Mr Fergurson:

Q. Is not this an acknowledged fact, that the butter market in Europe, in the higher qualities of butter, is less glutted than it is in the inferior grade—that is, there is a greater demand for the better quality?—Yes; the fact of fancy prices existing anywhere is a proof of the demand not being supplied, because those fancy prices do not indicate the intrinsic value of the article. They indicate simply this: that the taste of men, or their fancy, or whatever it may be, is such that it must have the article at any price within reason. Consequently, the supply being very light comparatively, the article brings an undue price. Now, as the quality of the whole of the product becomes better, the necessity for paying a fancy price diminishes. With an improved general quality of butter, the day for fancy prices, in my opinion, is over, and this fact shows that such a state of things demands that the quality of the general products shall be improved. Then, as the supply of the good article increases, so will the demand increase. It is one of those things in which the demand is created by its own supply.

Q. That is, if our best butter can be made considerably cheaper, we will still be able to compete with the fictitious article?—Yes; and I think that after a while this question of a cheaper butter will not be so important, when once we have secured the market. If we go to work and make a good quality of butter we can carry on the business profitably, and by improving its quality we will ultimately cheapen the cost of production and we will have a market for all that we are likely to produce.

By Mr. Hickey:

Q. I know that the great difficulty with our butter dealers to-day is that they cannot take our best butter into the English market and come in contact advantageously with oleomargarine. The artificial product is so nicely made, and it can be supplied so continually fresh, that it is difficult to compete with it. The highest priced butter there will continue to be unsalted fresh butter. I do not see how you can increase the quantity of butter and find a profitable market for it, unless you can solve this question. If anything could be done to manufacture our product in the shape of cheese, I think that is the only way that I can see out of the difficulty?—I did not refer solely to the question of fancy prices in England. But the dealers claim that the best prices are paid for even the salted packages of butter, and that the real butter always commands the highest price. The next highest price is paid for the artificial butter, and the lowest price of all is paid for the real butter that is of an inferior quality. There is a wide range between the different averages in these three grades of butter.

By Mr. Ferguson:

Q. That is, there is a fancy price above the price of our superior butter, but our superior butter commands a better price than superior oleomargarine, while there is yet an inferior and lower priced grade of butter?—Yes; the inferior grade of butter is far below the oleomargarine.

By Mr. Hickey:

Q. There is not such a great difference, because it is well known that butter made in this locality, especially the large shipments that go from Morrisburg to Liverpool, takes a stand on the English market as Morrisburg butter. Now, I know, from personal conversation with our butter dealers, that our best butter has hard work to compete with the oleomargarine, and I do not see how we are going to be able to continue the competition successfully?—I think that is only another evidence of the necessity for improving the quality. With reference to this market question, the position you assume is that our best butter shipped is shipped in its present condition. I notice that in Hodgson's circular, one of the last they have issued, they claim that the best butter exported sells much higher than oleomargarine, but that the supply is very limited. Then the oleomargarine comes next, and the inferior butter comes last. Now, a good deal of our Morrisburg and Eastern Townships butter is of an

inferior quality, and the question of packages is one that should be considered in connection with it. Butter that is well made and of good quality is often injured by the kind of package and the condition of the package in which it is put up. It may be that the package has not been properly treated in the first place, or that it has been allowed to lie in the warehouse in an unclean condition or with the brine improperly drained off. Butter is of such a peculiar character that it is affected by changes of temperature, and it suffers in consequence. Now, if this can be remedied, it will place the question in a more favourable light. It will make our butter, as it goes into the English market, a superior article. I think it holds good to-day, in England, that if we have a properly packed first-class article of butter it will arrive at its destination, if in good condition, a more acceptable article than the artificial product. I may be wrong, but that is my strong impression, gathered from the reports I see on the question, and also from the statements of dealers. But if I am wrong, it points out all the more the necessity for our doing all we can, if we are going to export butter, to improve the quality and to have the product put up in such a shape that it will reach the market in the very best condition.

By Mr. Sproule:

Q. Do you not think that the quality of the butter is materially depreciated on account of the packages in which it is packed?—Yes; I do.

Q. Have you had any experience in the material used in the manufacture of tubs, as to which is the best? In our county they make them generally out of pine, ash, or elm?—In the Eastern Townships, I think most of the tubs are of spruce, and they are considered satisfactory. The balsam tub is equal, if not superior to any. One objection to ash and other hardwood tubs is that they are heavy; but balsam and spruce make very light tubs. That brings us to another matter. I have long felt the use of a tub being coated on the inside, and not having time to experiment on the subject myself, I tried to inspire some one else to do it. The result has been that a gentleman of my acquaintance has been working with that end in view, and I understand from him that he has succeeded in keeping butter in a package, lined with a preparation of his own invention, for many months in good condition. He states that there was no loss in weight, for the package was wholly impervious to water, and that the action of the salt upon the coating was *nil*. Now, if we can get a light, cheap tub, one that will meet the demands of the farmer, and with a tight-fitting cover that will preserve the butter from contamination from outside odors, I think it will help to solve the problem.

By Mr. Trow:

Q. If the article of butter is so sensitive to unwholesome odors, do you not think a serious injury is done to it by having the packages of butter, more particularly in the country stores, in one cellar in close proximity to coal oil, or other obnoxious articles?—There is no doubt of that; go where you will, you will find smells in cellars and storehouses which will be sure to injure such a sensitive article as butter, if they come in contact with it. In the shipment of butter, I have no doubt that butter is often injured by the packages having been placed near to coal oil; but, of course, it does not matter what the odor is if it is foul.

By Mr. Sproule:

Q. Can this lining for tubs that you speak of be applied by any person or must the tub be purchased fully fitted up for use?—It will be done by the manufacturer very cheaply by the use of machinery. If left to the farmer, it would not be done at all. There is a way of treating the tub at present with salt, and Professor Arnold, in his valuable work, gives a receipe so simple that it may be done by any farmer. But it is not generally done. I would suggest that in making the tubs a printed paper should be pasted on the bottom of the tub giving a receipe for the treatment of the package, and making known the effect it would have in drawing the sappy matter from the tubs, and in making it more nearly impervious to water. But I think this other prepartion is going to be a success, and I hope that it will be placed, by private enterprise, before the farmers and butter makers of the country. It will do far more towards improving the quality of our butter packages than anything we have had as yet.

Q. Do you think it would be equally suitable for all kinds of material?—Yes, all kinds. We can use any kind of wood that would be light enough, and even these cull tubs that are now too often used would be just as good as any. I think, also, that by preventing soakage, it would improve the appearance of the tub outside, and thus help its sale. It is only to be hoped that as soon as possible it will be placed upon the market.

By Mr. Ferguson:

Q. Has it not been found by the butter dealers in Montreal, to your knowledge, that even when the market was glutted with ordinary grades of butter, there was an active demand for butter of a superior quality?—At the Convention at Richmond a few days ago, it was stated that in one instance a shipment of creamery butter was sent to Europe as a sample, and the butter was so well liked there that word was sent back for more of it. But the supply of butter of that quality was so limited, it was found impossible to obtain any more, although the country was scoured in search of it. Consequently, the dealer had to write back and say that he was unable to fill the order. I think this is proof conclusive that there is still a demand for butter in the European market, and I think there is a possible market in tropical countries, when we have learned to make and pack our butter in such a way that it will carry to those markets. It is not a question of this package or that package alone, but of obtaining the most favourable conditions in every particular, which is essential to our securing this trade. So I say, we have reason to believe from this fact that there is a large demand still unsupplied in the English market, for butter of a superior quality; and that, in addition, there is a possibility of other markets being opened to us.

Q. Then you think there is yet room for a possible market in superior butter, which we will not, for many years, be able to supply?—Yes.

By Mr. Trow:

Q. A gentleman has remarked, in my hearing, that he could not see that the evidence given here by yourself and Professor Arnold was in any way connected with immigration. What is your opinion in reference to that?—I hardly think this question requires an answer, but I would say that I can speak not only as a butter specialist, but also as a former employer of immigrant labour. I have not only employed immigrants, but I have brought out young men from England by sending them money for tickets. Only in a small proportion of cases was the result satisfactory, for in usual cases the men were not well adapted to Canadian work. I only speak of this to show that in bringing men to this country under the present system it is very difficult to secure in all cases those who will be a benefit to the country. But anything done in the way of improving the condition of things in the country will lead indirectly to a greater and better immigration than would be brought about in the more direct way. For instance, if you tax the farmer one, two, three or four dollars, and set to work certain agencies to improve his condition, to educate him and give him superior advantages, we make the country more attractive for others to come to it, and that very attractiveness is going to have a better and more pemanent result than would come of spending the same amount to assist directly in paying the passage out of immigrants. So I say, that while we need not neglect any existing agencies for populating the country, we ought not to forget that here is a possible means which, by a comparatively small outlay, may be utilized for the purpose of bringing to our country a desirable class of immigrants instead of the class of which we have too many under the present condition of things. Therefore, to foster the dairy industry and so improve the country, would be an actual and successful immigration policy.

By the Chairman:

Q. Have you any further suggestions to offer in connection with the improvement of the dairy industry?—I have referred to inspection, which I think would be one of the details to be carried out to make such a Bureau more effective. One desirable feature would be the establishment of a model creamery. If we want creameries in the country it will go a long way towards establishing them and giving them a chance for success, if we first have a model creamery carried on in the most advance way under official sanction, to which any person in any part of the country,

desiring to establish or work a creamery, could apply, in order to learn the improved methods, which it would be well for him to adopt. Many persons desirous of establishing creameries in different parts of the country, find such difficulties in the way, that with their present light they are unable to get over them. They do not know just what machinery to put in the creamery, and they do not know who to get to do the work. If the Government had a model creamery, to which people could go and learn, it would be a very valuable help. Then, in connection with the creamery, a certain amount of experimental work could be done. There is need for more knowledge on the subject; and our Government cannot do better than expend a reasonable amount of money in the way of experiments, utilizing the results of experiments made elsewhere, and in such ways improving the industry. There are other ways, also, whereby a Bureau, under the Department of Agriculture, could carry on advanced work, and I think if we were to do it, with our present advantages; with our present light upon the subject; with the present disposition of this country to take advantage of our adaptation to this industry, it would perhaps be the means of placing the Dominion of Canada ahead of any other country, not excepting Denmark, in the art of making butter and cheese. The sentiment of the country in this direction must not be under-valued. I find by my visits to the States, that there is not there a disposition on the part of agriculturists to allow the Government to expend for agriculture just what it wants to do and not grumble at it. It is altogether the other way in Canada. Rather than grumble at any such expenditure, our people applaud it, and urge the Government to do more in that special line. Such is the difference between the sentiment of our people in Canada and the sentiment of the people of the United States, and we ought to take advantage of the sentiment here, and when we consider that it would require but a small outlay to do all this, we should make an effort to move in the van.

By Mr. Sproule:

Q. You are of the opinion that the Bureau should be established by the Federal Government?—By the Federal Government, for the reason that if that plan were not adopted, each Provincial Government would have to do it for itself, and, as a matter of fact, they would not all do it.

By Mr. Cochrane:

Q. From the time you commence to skim the cream, how long should it be kept before you quit putting the cream into the same churn?—That has got to be determined by the temperature in which you have to keep the cream.

Q. But I mean on the principle you advocate?—By putting in the fresh cream at each skimming with the new cream, and having the temperature at about sixty degrees, you have a considerable margin. It is desirable, in general practice, leaving aside the fine points of the question, in order to get the most economical and the best results, that the cream turns slightly sour before churning, and that it be churned as soon as possible after it has turned sour. If it be at sixty degrees, there will be quite a margin. If the churning were done twice a week, it would be better, other things being equal, than once a week. Three times a week, if there is a sufficient quantity of milk, would be even more desirable. If the process is adopted of putting the butter of each churning into a granulated butter-holder, to be worked at another time, the churning may be even more frequent. But there is a margin, and if the cream is kept under favourable conditions for even a week, an excellent article of butter may be made from it.

By Mr. Ferguson:

Q. Are you in a position to give us any idea—do not answer the question if it is a private matter—of the character of the substance to which you refer, by which the packages are to be lined?—I am not in a position to give you the details of it. I can only say that it is a coating thoroughly impervious to water, quite harmless to butter, and well suited to the purpose. I could not go further. I got it from another gentleman, and I have no right to say more.

By Mr. Cockburn:

Q. I suppose the invention is patented in Canada?—It is not yet, but the gentleman who invented it is likely to patent it, in order to get some return from his labour.

The Committee adjourned.

MR. CHARLES H. IRVIN'S EVIDENCE.

METHOD OF TAKING STATISTICS AT PORT HURON—FIGURES PUT DOWN WITHOUT COUNTING—MR. IRVIN'S OWN POSITION AND MANNER OF REMOVAL.

OTTAWA, 13th March, 1884.

The Committee met, Mr. WHITE (Renfrew) in the Chair.

CHARLES H. IRWIN called and examined.

By the Chairman:

Q. Will you please state your name to the Committee?—My name is Charles Harrison Irwin.

Q. You have been employed at Port Huron; will you please state in what capacity and for how long?—Do you mean in regard to my employment in the Customs, or in other positions as well?

Q. I refer to the whole period of your employment?—I was employed as baggage master for the Grand Trunk for a period of ten years at Port Huron, and I was also Deputy Collector of Customs at Port Huron for a period of eight years following.

Q. When did those eight years expire?—In 1879, I think.

Q. Please state your relations to, and your duties in connection with, the Port Huron Custom House?—I was inspector of personal baggage crossing the river—passengers baggage—and I also had to make out a daily report of the immigration of each succeeding quarter, and I made out almost all the returns that were sent to the head office at Port Huron from the Grand Trunk crossing at Fort Gratiot

Q. Did you assist in obtaining the immigration returns?—I did not; I made out the returns, but there was no obtaining of them at all. I made out the returns, but did not obtain them in any way, shape or form, except by simply—you may call it guess work, or estimating them.

By Mr. Trow:

Q. Were those returns made under oath?—No, Sir; not by me.

By the Chairman:

Q. How long were you employed in performing those duties?—I was employed for some time previous to my connection with the Customs. When I was baggage master for the Grand Trunk, the Deputy Collector in charge at Fort Gratiot asked me to make up those returns for him, as he knew nothing about them, so I did that work for about two years previous to my connection with the Customs, when I was baggage master there.

By Mr. Hickey:

Q. In what year was that?—It must have been about 1870 or 1871, I think. I cannot be positive without having my commission to refer to.

By the Chairman:

Q. Will you please inform the Committee in what manner these returns were obtained?—As I stated before, they were not obtained. The only guide I had was the return for the corresponding quarter of the preceding year. I used to keep a copy of that, and then make out the returns, if anything a little larger for that year than for the preceding year. That was about the instructions I received.

By Mr. Hesson:

Q. Had you instructions to that effect?—Not exactly instructions, but I was led to understand that this was expected of me.

By Mr. Kranz:

Q. Was that by the American Government or by some superior officer?—No; by the officer at the head office at Port Huron, who tabulated the statements from the whole district, mine amongst the number. He received reports from each outport in the district, and then compiled them all together.

By the Chairman:

Q. To whom did you hand your report?—To Henry Botsford, Deputy Collector at Port Huron.

Q. When you were baggage master of the Grand Trunk Railway, had you any knowledge of the manner in which these immigration statistics were obtained?—Yes; just as much as I had afterwards. There never was any difference in the way of obtaining them.

Q. So that, in point of fact, it was a matter of estimation?—Entirely.

Q. When did you leave the Grand Trunk employ as baggage master?—I think I left the Grand Trunk service in 1871. I am sorry I came unprovided with my certificate of character from Mr. Spicer, but I think it was in 1871 or 1872; I would not be certain.

Q. When did you leave the Customs?—In 1879 or the spring of 1880. I think it was in 1880.

Q. Have you any objections to inform the Committee of the reasons why you left?—No, sir; I have not. Mr. Sanborn, who aspired to the position of Collector, made promises to a number of parties while working for his appointment, and when he secured the position he filled the Deputy Collectorship and several other positions which became vacant about the same time, with those who had helped him in securing his appointment. The consequence was that myself and three others were let drop out, and we were not re-appointed, but three weeks afterwards I was re-appointed as American Customs officer at Toronto, to show that I did not lose my position on account of incompetency or neglect of duty.

By Mr. Hesson:

Q. How are you now employed?—I am connected with a wholesale firm in Detroit.

By the Chairman:

Q. What were your reasons for leaving the Grand Trunk employ?—To go into the Customs. I was offered the appointment.

By Mr. Hesson:

Q. How long were you in the service at Toronto?—During three seasons of navigation. I was in the employ of the United States Customs.

Q. What position did you fill there; the same as at Port Huron?—I was to attend to a line of steamers running from Oswego to Toronto. I received freight there, and bonded it through Canada to Port Huron, and continued to do so for three summers, until the Northern Transportation Company broke up, and the line was discontinued.

By Mr. Landry (Kent):

Q. I did not understand from you whether your employment at Port Huron was under the American or the Canadian authorities?—Under the American authorities entirely.

By Mr. Hesson:

Q. Were you simply following out the practice that had existed previous to your accepting that position?—Yes, sir.

Q. And no instructions were given to you?—No, sir.

By the Chairman:

Q. Do I undstand you to say that in making up these immigration returns, you did not take any means of verifying the correctness of the returns made to the Government, and that the statements or returns sent to the Washington Government, and published by them as authentic, were, in point of fact, not authentic?—Yes; you can clearly understand me to say that there was no attempt made to get at the actual registration of these immigrants whatever.

Q. In what manner did you make up your estimates?—I always kept a copy of the report for the corresponding three months of the previous year, and I would fill out a new blank, simply altering the figures somewhat, and making the return, on the whole, a little larger. For the last three years we had to reduce the figures, because the immigration had fallen off, as the numbers of passengers in the trains easily showed.

By Mr. Hesson:

Q. Do you consider that was a fair fulfilment of the duties you were called upon to discharge?—I thought very little of it. It was a common thing there, and we could not have done the work in any other way, with the time and the help at our disposal. The returns were given me to fill up in that way, and I thought nothing particular of it.

By Mr Trow:

Q. Did you make a gradual increase in every quarter?—Almost always, until during the last three years of my time, when the immigration fell off some, and there was not an increase made in the returns for those years.

Q. To whom did you make those returns?—To Mr. Botsford, who compiled the returns from the various ports in the district, and then sent them to Washington.

Q. Did you inform Mr. Botsford how these returns were made up?—He knew it perfectly well.

Q. Where did you get the data to start your first report from?—I got them from the officer in charge at Fort Gratiot. That is the gentleman who makes that affidavit without a signature. He was the officer in charge, and he gave me just what he thought was the manner in which they were sent down to the head office.

By Mr. Hesson:

Q. Did you inquire as to the practice pursued at other ports in collecting this kind of information?—No, sir; I did not know what was done at other ports.

Q. You were not aware that better facilities were provided at the other ports for obtaining information?—No, sir; I did not know anything about the other ports.

By the Chairman:

Q. Have you any knowledge as to whether or not the same system that was adopted at Port Huron has been continued since, or whether there has been any change in the system?—It was continued for some time after, when I was at Toronto, by the man who filled the position I had been filling.

By Mr. Hesson:

Q. That would be from 1880 to 1883?—Yes; somewhere about that date. Then Mr. Nimmo came up, and I believe there was some attempt made to try and divide the number of immigrants on the trains, but it was not carried out.

By Mr. Paterson, (Brant):

Q. You just made your report on a slip and sent it in to the head office?—I attached a copy of my statement to Mr. Matheson's letter to Mr. Lowe; it was simply a memorandum to Mr. Botsford.

Q. What did Mr. Botsford do with it?—He took the whole of the reports from the different outlying ports, and compiled them and put them together in printed blanks, and sent them to Washington.

Q. Were they signed by Mr. Botsford?—I presume they were signed by the Collector.

Q. Did he attest to, or vouch in any way for their correctness?—I could not say.

Q. Have you any knowledge of that, whether or not the document that was sent to headquarters was attested to?—I could not say; I know nothing about it.

Q. I suppose you know that it became part of the statistics of the country?—Yes, Sir.

Q. Would you not have some pangs of conscience in month after month and year after year sending statistics which you knew were wholly and purely guesswork; and in sending those figures to headquarters as authentic, did you not feel that you were involving the honour of the whole American Department? Did you not feel as though you would rather have left the service sooner than you did?—I did not think of it in that way. It was simply a matter of joke. I used to send the returns down to Mr. Botsford as nearly correct as I could.

By Mr. Trow:

Q. What do you mean by saying, "as nearly correct as you could," when you did it all by guesswork?—I used to estimate the different quarters of the year a

trifle more than the preceding quarter. There was no estimation made of nationalites by me.

Q. When were you on duty—by night or by day?—I was on duty at night for the last four years.

Q. Then you could only report for the night travel?—I reported the whole thing.

Q. Even when you were not on duty?—Yes. I reported for the whole quarter.

By the Chairman:

Q. I understand you to say that you did not look upon this work of making those returns as being serious statistical work at all. It was merely obtaining figures for the Department, without having regard to the facts whatever?—Yes, Sir. I never looked as far as Washington; I merely looked for the returns of the preceding year for the corresponding quarter, and sent my report, so made up, to Mr. Botsford.

Q. I see by this memo. read before the Committee at its last meeting, that a certain number of immigrants are set down as having come from different countries, as for instance, Germany, Sweden, and so on. Did you take any means to ascertain whether or not the proportions obtained from the different countries were correct, relatively, in proportion to the whole, or was that mere guess work, as well as the rest?—I just used the same means to get those statistics as the others. I would watch pretty well as to how the different nationalities would average, and that was about the only thing. If there were more Norwegians than Englishmen or some other nationality, I would give it a sort of general average.

By Mr. Trow:

Q. Would not that be somewhat difficult to do? You must be a physiognomist?—Oh, no; if you had been there as long as I have been, you could tell the different nationalities without speaking to them. I worked amongst them as baggage master so long that I could understand them quite easily.

Q. Would you know from an immigrant's appearance whether he was a tinker or a tailor?—My return did not comprise that; it only referred to nationalities.

By Mr. Hesson:

Q. Where is that portion of the return made up?—At the head office, by Mr. Botsford.

By the Chairman:

Q. Do you mean to say that Mr. Botsfond divided those returns of the immigants into the different trades and professions, without having any information whatever?—Yes; without any information that I know of.

By Mr. Paterson (Brant):

Q. Are you a citizen of the United States?—Yes.

Q. I should think it would naturally suggest itself to your mind, that all those facts and statements that you have just made would tend to discredit the whole service of the United States, and also to not reflect lustre at any rate, upon any party engaged in doing that kind of work. One would naturally suppose if one had done anything of that kind, involving the honour of the Department, that he would not care to mention it. Might I ask you what led you first to give publicity to this statement, from which you hope to make no personal gain, and which involves in a sense the honour of your country?—You can blame the Collector at Sarnia for that. We were very old personal friends, and had worked together for about 23 or 24 years. Mr. Matheson was anxious to get at these facts, and I, not knowing how far the thing was going—in fact, I had no idea that it would ever come to this—just wrote him in a pleasant way, stating how it was. If I had known it, I give you my word I would not have made the statement to him; but when I found it was going so far, I was not going to eat my words, because it is all perfectly true.

By Mr. Baker (Victoria):

Q. What is the name of the gentleman who used to go through the car with you, and assist you in collecting these valuable statistics?—Nobody assisted me, because there was nothing of the kind done.

Q. But there was some gentleman who assisted you in some way, whose name does not appear. He uses your name very freely?—I happened to know who he was, from the style of his affidavit, but I do not know it positively. I would rather not mention his name.

By Mr. Paterson (Brant):

Q. In connection with your correspondence with Mr. Matheson, might I ask if he opened the correspondence and solicited this information from you?—Well, not exactly in that way. We used to meet frequently, and Mr. Matheson said one day, "Charley, you know all about this, and I would like to know how it is done." I then told him as a friend how it was done. I had no objection to tell him. He knew it all along, because he was intimately acquainted with the service, but of course he could not get it from any one who was actively engaged in the Government employ.

Q. What reason did Mr. Matheson assign for desiring to get this information from you?—He simply said that "we"—meaning the Canadian Government—"do not believe that the statistics given at Port Huron are correct, and we would like to get at the true inwardness of the case."

By the Chairman:

Q. I suppose that Mr. Matheson, living as he did upon the Canadian border, and having to some extent a knowledge of what was going on, had suspicions that these returns were not correct?—He had a certainty of it. He could not help knowing it. He had been told, I think, by almost every officer in the force, but of course he could not use their names.

By Mr. Paterson (Brant):

Q. Had you any reason to suppose that Mr. Nimmo was conversant with the manner in which the work was done at Port Huron prior to this time?—I could not say.

Q. And you do not know what led him to change the plan of collecting the returns at Port Huron, or to insist on it being better done?—I think it was owing to the exceptions Mr. Lowe had taken to the returns, which led him to come and try to investigate the matter.

Y. In what year?—In 1882.

Q. Then it was a change that was made at the time you were working there in 1880?—I am not sure of the year, but I think it was later than 1880.

By Mr. Hesson:

Q. You do not say there was a change made in the system?—There was a change attempted to be made.

Q. By putting on additional help?—No, Sir; not entirely that. They made other changes. A man was detailed to attend to that part of the work entirely, but it never came to anything, and it was carried out in this way: that an officer went through the trains examining the hand baggage, and asking questions from the passengers, of which he took notes in a book provided him, and made a return from these. That was the system ultimately adopted.

Q. That was after you left?—Yes; when I was in the office in Toronto.

Q. Have you any knowledge that it was carried out by personal enquiry of the passengers?—It was done for some little time, but I do not think it was generally adopted. I know they attempted to do it, but whether or not they carried it out I cannot say.

By Mr. Trow:

Q. Had these unguarded reports anything to do with your dismissal?—Not at all. The fact shows for itself, because I was re-appointed three weeks afterwards. I was not dismissed; my term of office was out, and I was re-appointed three weeks afterwards as American Customs officer at Toronto. This shows that I was not guilty of any misconduct.

By Mr. Hesson:

Q. What system is being pursued there now, to your knowledge?—I am not living there now; I am living at Detroit.

By Mr. Landry (Kent):

Q. Are there very many trains arriving and leaving at Port Huron during the hours that you would be on duty?—Yes.

Q. What is about the average?—About six a day—that is, both east and west—three each way.

Q. While you were on duty what would be the largest proportion?—While I was on duty I would have four trains to attend to.

Q. Were you required to pass from one end of your train to the other in making this examination?—No, Sir; there were other officers on duty with me; each took a certain department of the train. The ferry boat had three tracks on it, and the train was usually divided into three sections, so each of us took one track and examined that part of the train while the boat was crossing, so as to expedite business.

Q. That was to examine the baggage?—Simply the hand baggage; not to make enquiries.

By Mr. Landry (Kent):

Q. Would that be sure to bring you in contact with all the passengers?—No, Sir, not with all the passengers.

By Mr. Paterson (Brant):

Q. These men who helped you were equally responsible with you, were they?—Yes.

By Mr. Landry (Kent):

Q. Did they hand you any figures?—No, Sir.

Q. Did you keep a tally or memorandum of the passengers from day to day?—No, Sir.

How did you make out these blank forms?—Oh, I simply did it as you see them there.

Q. Would you have any memoranda which would help you to make them out at the end of the three months, or did you simply set down the figures?—I did it simply by having a copy of the report of the corresponding quarter for the preceding year.

Q. Then you did not put down a single figure for the whole three months?—Not till I came to make out the return.

Q. You relied upon your intimate knowledge of the different nationalities to remember how many you met, and how many you did not meet, but the others met?—Yes; except, of course, under exceptional circumstances, where a large number of Germans or Norwegians would arrive at one time. Such a circumstance would be taken into account in making up the quarterly return.

By Mr. Hesson:

Q. Would your trains often be larger than six cars?—Oh, yes; we would have nine cars sometimes.

By Mr. Paterson (Brant):

Q. Did you take care to exceed the totals as well as the different divisions in the nationalities—Germans, Norwegians, and so forth?—Yes; we averaged the various nationalities, and had a slight increase in each.

Q. You did no injustice to other countries—you gave as free admission to a Norwegian as to a Canadian?—Yes, Sir.

By the Chairman:

Q. I understand you to say that you kept no memo. during the whole quarter which would guide you in making up your returns, so that whether there was a decrease or an increase in the number of immigrants coming in at that port, you made up your returns without any regard to the facts?—Yes; unless there was an exceptionally large lot of Germans, for instance. Sometimes the passengers from a couple or three sailing vessels would arrive at one time.

Q. As regards the whole number there was no difference?—No, Sir.

By Mr. Landry:

Q. If there was an exceptionally large lot of Germans, it would not make you increase the number of Norwegians in the same ratio?—Oh no; they used to come in by ship loads, accompanied by interpreters.

By Mr. Paterson (Brant):

Q. Did you take any account of passengers going eastward?—No.

Q. Do you think these figures have any effect upon the commercial standing or the business standing of the railways?—No, Sir; not that I am are of.

Q. Would it not have the effect of showing the increase in the travel, and advertising, as it were, the business of the railway?—I do not think that that was ever taken into consideration, one way or the other, at all.

Q. Then there was nothing that you know of which was sought for by these figures, excepting statistics relating to the increase of immigration?—Well, there was a certain pride that we used to have in keeping Port Huron the third port in point of immigration in the United States. That was about the way it was put to me.

By Mr. Farrow:

Q. Could you have performed your duties correctly if you had wished to do so, so as to have known all about the destination of these passengers?—I could not unless I had given my undivided time to it.

Q. Was there time enough at that point to do that work properly?—No, Sir; not without detaining the trains.

Q. How long would the trains have have had to be detained to get that knowledge?—That would depend, of course, upon the size of the train. It would have been a plump half hour's work for three of us, with the ordinary run of trains, carrying 180 to 200 passengers.

Q. Do you think you could have done it in half an hour?—I think so.

Q. Do you think if we had a couple of men at Emerson, they could find out in this way, the number who go to settle in Manitoba, by detaining each train half an hour?—If you took the right way about it, and went to meet the trains, you could do it.

By Mr. Landry (Kent):

Q. How long did it take you to cross over on the ferry boat?—We were usually half an hour in crossing.

By Mr Trow:

Q. Did you get any lists of the passengers from the interpreters who accompanied them?—No; they used to keep the lists themselves, but they would give us the figures. During the time before the Allan line of steamers ran they used to furnish lists, when the immigrants came over in sailing vessels. I had nothing to do with the immigration at that time, but I know it was done.

By Mr. Baker (Victoria):

Q. What was the object in going through the trains at all?—It was done on both sides of the river, to examine the hand baggage. It was a Customs examination solely.

By Mr. Trow:

Q. That examination would give you no particular gauge of the numbers passing through, would it?—None at all.

Q. Because many servant men go over who have no baggage at all?—Yes.

By Mr. Hesson:

Q. Had you any instructions to take particular notice of those who passed through on their way to the lumbering camps in Michigan?—We had no special instructions about them, one way or the other.

Q. Were they always counted?—Yes.

Q. Was there a large number of passengers of this class?—Yes; we used to expect a large number of French Canadians going through, every fall, to the lumbering camps, and coming back in the spring. Of course we could not help noticing them.

By Mr. Paterson (Brant):

Q. Were your returns approximately correct on the whole. Do you think that they were pretty nearly right. Of course you say you were not working on any system; were your returns grossly exaggerated?—I think, to be honest and truthful

about it, that at the first they were about as nearly correct as they could be, but they were increased every year and they got to be very incorrect at the last.

By Mr. Trow:

Q. Were some of your reports found to be not very satisfactory, and were they returned to you?—On one occasion they were returned to me.

Q. For what purpose?—They said there was not the proper proportion of women and children.

Q. You had to manufacture them, had you?—I asked them where I was to get more, and they said I was to manufacture them.

Q. Who gave you that instruction?—It was just a joke between Mr. Botsford and myself. There were no instructions about it.

Q. But he returned you your previous return?—He sent it up to the office; I did not see him personally at the time. It came up in the day time.

Q. Did you enlarge it?—I forget now how I did it. I know I made it satisfactory.

By Mr. Hesson:

Q. Would the increase from the time you first took charge of that port up to the time you were recalled, or you resigned your position, be very considerable?—It would be considerable; I could not give the exact figures.

Q. Do you think it would be 50 per cent.?—I should judge it would.

Q. Would that increase be likely to be covered by 50 per cent.?—I should judge that from the time I began, and during all the time I was there, the increase would amount to that. It would amount to one-third, anyway.

By Mr. Paterson (Brant):

Q. When you commenced this work in about 1871 or 1872, you think the figures were about correct, as you took them?—About correct, as I estimated them.

Q. But when you went on down to 1874 you think the figures became exaggerated, owing to this increase?—Yes.

By the Chairman:

Q. Has this system been continuous for the last six or seven years?—I cannot say positively about what has been done since I left the force. I do not know anything about it.

Q. What means had you of knowing that the returns, which you say were tolerably correct, when you undertook your duties in 1871, were so correct?—At that time the immigration was a great deal larger than it was some time afterwards.

By Mr. Paterson (Brant):

Q. Between what years?—When I first commenced making out my returns.

Q. Between 1871 and 1874?—Yes; the immigration was much larger at that time. Then there was a far better chance of getting at the actual numbers, because they used to come out in ship loads. We could get the numbers much more accurately, and with less trouble.

By the Chairman:

Q. Do I understand you to say that you estimated those immigrants coming from Europe as coming from Canada, even though they only came through Canada?—Oh, no Sir; those of foreign nationalities were entered as having come over the seas.

By Mr. Hesson:

Q. But the immigration covered the whole travel. You supposed that the train held so many people, and you took them all as immigrants?—No; I did not use to trouble myself much about the number of passengers.

By Mr. Trow:

Q. Do I understand you to say that the immigration was larger from 1870 to 1874 than from 1874 to 1879?—I think the actual immigration was larger.

Q. And yet your reports show a steady increase?—I have explained how that was; I went on from year to year always adding a little to the number.

By Mr. Bain:

Q. When you speak of the immigration, do you mean all parties crossing the border, or foreigners only?—We are supposed by the Department at Washington to take account of only those who are going in as settlers.

Q. When you say the immigration decreased at a particular time, do you mean that it decreased in its foreign population—those coming from other countries—or do you mean that the general average of those who crossed the border decreased in number?—I mean more particularly the foreign immigration. It had slacked off very much.

By Mr. Hesson:

Q. That was, there was a decrease in the foreign immigration, in your estimation?—Yes; I had no means of actually counting them.

Q. Do I understand that those who went to the lumber woods in Michigan were included?—Yes.

By the Chairman:

Q. Did you distinguish, in your system of making returns, between those immigrants coming from Canada and those who only went through Canada from the older countries, except as Norwegians and other classes of foreigners, whom you could distinguish by their language. As a matter of fact, as regards all English speaking immigrants who went in at this point, had you any means of distinguishing between those who were immigrants from Canada and those who passed through Canada?—No, Sir.

Q. How did you estimate, then, a certain number of immigrants as coming from Ontario, and Quebec, and Nova Scotia. Was that mere guess work?—Yes, that was guess work. We used to estimate the Lower Canadians as so many, and divide them up between New Brunswick and Nova Scotia, and so on.

By Mr. Bain:

Q. It seems that at some seasons you had more immigrants from the Lower Provinces than at others?—The fact of the matter is, I did not pay much attention to the trains. I used to make a regular increase until it slacked off, so that I stopped increasing them.

Q. But you used to make your increase fluctuate to a certain extent, as it was apparent that there were fluctuations in the volume of travel?—Oh, yes.

Q. Did you include in your statement those who crossed to go to the lumber woods in the fall and returned in the spring. Were they taken as immigrants?—They were counted in along with the others

Q. As immigrants to the United States?—There was no special distinction, as far as they were concerned. The whole trouble was that nobody had time to do the work properly.

Q. As an old railroad man, do you think there was any process by which you could have approximately checked the number of those who left the country and those who came in, by an examination of the railway tickets, or by any process of that kind?—I did that when I was baggage master. That was what I aimed at when I started my work. It is part of the law over there that all baggage going to Canada has to be re-checked on crossing the river. In re-checking that baggage I used to be able to get a sort of half correct idea of the volume of the travel.

By Mr. Hesson:

Q. Are you aware of any condition being attached to the furnishing of information on immigration matters to the Department at Washington; that is, of a *per capita* allowance being made by the United States Government to the officer in charge on the number of immigrants into the country that he returns?—No, Sir; I am positive there is nothing of that kind.

Q. You are sure there is no incentive of that kind to induce him to swell the number?—No, Sir.

By Mr. Bain:

Q. As a railroad man, could you not approximately arrive at the number we lost by comparing the quantity of baggage checked each way?—I have answered

that when I was baggage master I got some idea of that kind from the number of checks I used to issue. I used to estimate that about two-thirds of the volume of travel was immigrants, and the remaining one-third would be travelling passengers.

By Mr. Hesson:

Q. Would it be possible for the railway authorities to furnish reliable information as to the total quantity of travel each way?—That could not really be done without questioning the parties themselves.

Q. I do not mean their destination, but the volume of travel both ways. From the actual sales of tickets you could get the number of passengers, and this two-thirds rule, I suppose, would apply each way?—That would hardly do. I might issue a ticket to a single man to whom I would issue three or four checks.

Q. I do not mean checks, but tickets?—It would be a guide, to a certain extent, but not one to be relied upon.

By Mr. Cockburn:

Q. Would not the other third have return tickets?—They might.

By Mr. Bain:

Q. Then you think the ticket system would give you only an approximation?—I think it would give the total travel, but that is all. Of course you could arrive approximately at the number of immigrants from that, but it would not be certain. I think, with a little work, however, it could be done too.

Q. But it would not be of any value to get the figures of the real immigration?—I do not think so.

By Mr. Cockburn:

Q. Did not the lumbermen all return in the spring by the same way that they went over?—No; they came back, some by the Beatty line of steamers, and all methods and ways. There was only one way of going over from Lower Canada, and that was by the Grand Trunk, but they came back many other ways.

By Mr. Bain:

Q. Your Michigan lumbermen all came back your way?—No, Sir, they did not; some of them went round the other way.

By Mr. Armstrong:

Q. You say you left your situation in 1879. Have you any means of knowing whether or not this haphazard system was continued after your time?—I think it was for some time after I left, until Mr. Nimmo came up, and then it was changed for another system.

By Mr. Cockburn:

Q. How is it done at the present time?—I have stated that I have no knowledge of how it is done now.

By Mr. Armstrong:

Q. I understand that the effects of parties who go over to settle in the United States pass free of duty. Is there any means of knowing the number of immigrants from that?—Not at all; because a great many young men have but a small quantity of hand baggage with them, and no note of them would be taken. Household effects are passed in free of duty, but they are charged a small entry fee.

By Mr. Bain:

Q. Did you attend to this part of the work, or was it done by another officer?—I attended to those entries.

Q. Did you keep an official list of those?—We used to make out regular immigrant entries, and return them to the office, with the money, each day.

Q. Then the office records would show those?—Yes, Sir.

Q. Would it show also the number in each family?—No; it would show just the number of articles of household goods, tools of trade, horses, &c.

Q. Would you not ask the number of persons in the family?—No, Sir; the head of the family only, signed the entry.

By Mr. Hesson:

Q. Those would be *bona-fide* settlers, undoubtedly?—Yes; they made oath to that effect.

Q. What proportion would this class form of the whole volume of travel?—I could not give you any idea of that.

Q. Would they form a large or a small percentage?—I really could not give you any idea or estimate as to how they would rank with the whole foreign immigration. I should judge, perhaps, they would form one-tenth, but I could not give you any definite idea.

Q. In what year were you appointed Deputy Collector?—I think it was in 1871.

Q. What are the regulations in reference to the acceptance of office in the United States service? Are you placed under oath?—Yes, Sir.

Q. What is the nature of the oath?—Well, I can hardly remember.

Q. That you will perform the duties of an American officer to the best of your ability, faithfully, honestly and truthfully?—Yes; I suppose so.

Q. Did it not come to your mind occasionally that those returns were hardly made in compliance with your oath?—I just followed the instructions of my superior officer.

Q. Who was that—Mr. Botsford?—No, Sir; the officials at the head office.

Q. Which of those officers was the keeper of your conscience?—I do not know that there was any conscience in the matter. I did not know that I was violating any great law in doing what I did.

By Mr. Cochrane:

Q. I understood you to say that your duty was to check the baggage?—Yes, Sir; when I was baggage master.

Q. But latterly?—Latterly I was Deputy Collector, as well as examiner of baggage.

Q. And you consider you performed that duty honestly and faithfully?—I did that work honestly and faithfully.

By the Chairman:

Q. Speaking of those entries to which reference has been made, did they apply to foreigners going through from Quebec as well as to Canadian citizens?—Yes; but the entry fee was not charged for at exactly the same rate. We did not charge quite as much to foreigners as we did to Canadians. Foreigners were charged 10 cents per entry, but those coming from Canada with tools, horses, and so forth, were charged at that time 85 cents.

By Mr. Hesson:

Q. For each simple entry?—Yes.

By Mr. Landry (Kent):

Q. Did your commission contain that, as part of your duty, you were to make up those statistics?—No, Sir; it did not.

By the Chairman:

Q. Then you in no way violated your oath of office in making this return?—No, Sir; it really was not my work to do at all. It was not my duty, as night officer, to make any of these returns.

By Mr. Trow:

Q. But have you not sworn to the statement that you sent to Mr. Lowe?—Yes; I believe so.

Q. And you swore there that you made a false return purposely?—I swore that that was the way I made up those returns. It was not part of my duty to fill up those returns, but I was asked to do it by Mr. Botsford, the officer at Port Huron, who made the returns to Washington.

By Mr. Cockburn:

Q. You say you cannot tell in what way the office has been conducted for the past three years?—Not for the last three or four years.

By Mr. Bain:

Q. I understood you to say that you made up the returns from 1871 to 1878?—Yes; I made up the returns for about ten years.

Q. You commenced in 1869, or 1871?—About 1871.

Q. And you added a certain percentage, from year to year, as your time wore on?—Yes; as I have previously stated.

Q. I see, in looking at the returns, that in 1871 there were in round numbers 36,000 immigration. In 1872 it had risen to 38,000, and in 1873 it was 58,000. As those were some of the first years of your tenure of office, perhaps you will remember the circumstances?—No more than just what I have told you, that we increased them yearly.

Q. But you see from 38,000 to 58,000 is an enormous increase. Can you not give some explanation as to the way it was brought about?—The Franco-German war may have contributed to that rapid increase; a very large number of immigrants came out about that time.

Q. Then I see that in the following year it fell 10,000, down to 48,000, but still it was large. Do you remember anything with reference to that year?—No, Sir, I do not. I think it was owing to the fact that the German immigration was forbidden about that time.

Q. Then in 1875 it fell to 34,000?—As I have told you, there was a portion of the time for which we did not make any increase, because the immigration had fallen off.

Q. And in 1876 it fell from 34,000 to 31,000?—Yes; that was a decrease.

Q. And in 1870 it fell to 30,000; that was a decrease also?—Yes; as I have told you, during the latter portion of that period we decreased the numbers.

Q. And in 1878 there was a slight increase—from 30,100 to 30,600. Now, I think you informed the Committee a while ago that the figures increased year by year, and that you were actuated by a desire to bring Port Huron up to the position of being the third port of the United States in the volume of its immigration?—I also stated that during the latter part of this period I did not increase these figures.

By the Chairman:

Q. Were you personally responsible for the reports as they were published?—No, Sir.

By Mr. Trow:

Q. During how many years did you make these returns?—During about ten years.

Q. And you commenced in 1871, I understood you to say?—About that length of time; I could not exactly give the dates.

Q. When were you dismissed from the service?—I never was dismissed. My term of office expired in 1879 or 1880.

Q. Were you not dismissed in 1879?—I was not dismissed at all.

Q. I think I have a certificate of your dismissal, dated April 5th, 1879. It reads as follows:

"CUSTOM HOUSE, PORT HURON, MICHIGAN,
"COLLECTOR'S OFFICE, 7th March, 1884.

"I hereby certify that the records of this office show that Charles H. Irwin, formerly a Deputy Collector and Inspector of Customs for the District of Huron, was removed from office, April 15th, 1879, and from that time till to-day said Irwin has never been employed by the Customs at this point or Fort Gratiot.

"FRANK WHIPPLE,
"*Special Deputy Collector.*'

—I was not dismissed from office for any cause, but, as I have stated, I was left out, and with others, not re-appointed, when my term expired, for political reasons, and shortly afterwards re-employed at Toronto, by the Port Huron Customs Collector.

Q. How could you make reports when you had been turned out of office?—I could not tell you the exact date unless I had my commission.

By the Chairman:

Q. The first returns you made were made when you were baggage master?—Yes, Sir.

Q. And those, you think, were made up approximately correct?—It must have been in 1871 that I went into the service, and I made these returns two years previously to that, when I was baggage master. I was employed at this work for eight years, but for two years previously to that I was baggage master. These were the ten years during which I was employed altogether.

By Mr. Bain:

Q. I presume you made out those returns in 1869 and 1870?—Yes, Sir.

Q. Then it appears that those figures were yours up to 1878 or 1879?—The certificate appears to be dated 5th April, 1879.

Q. So that, apparently, your memory is at fault when you tell us that you added a slight percentage, year by year to those figures for the purpose of satisfying your superior officer, when, as a matter of fact, there was a shrinkage every year after the first three years?—I was not responsible for the total from the whole district, of which Port Huron was only one port. The Port Huron returns might show a steady advance, while those for the district might have decreased, on the whole.

Q. How many officers made returns to that port?—There were officers at St. Clair, Saginaw, and an officer at all the lake ports between Saginaw and Port Huron. There was also an officer at the foot of Barkeley street, in Port Huron, and an officer at the Chicago and Grand Trunk depot. All of those had to make returns to Mr. Botsford.

Q. What facilities had they for delivering passengers compared with those at your point. Were they small local points merely?—The Great Western used to cross at the Chicago and Grand Trunk crossing.

Q. Do you not suppose it would be likely that those other officers would have the same instructions from their superior officer as you had?—I cannot speak about them at all.

Q. But you think it was quite likely that that would be the case?—I think the same system was pursued, but I do not know anything about it.

By Mr. Paterson (Brant):

Q. Was it your duty to accompany the trains across from Point Edward to Fort Gratiot?—Yes, Sir.

Q. You would, then, have some idea of the length of time occupied from the arrival of a train at Point Edward to its final departure from Fort Gratiot. I think on the occasions I have been across, it would be from half to three-quarters of an hour.

Q. What is the length of time from, the time you board the train at Point Edward, till it is ready to leave Fort Gratiot?—Half an hour was the time allowed by the Grand Trunk Railway.

Q. Then three men would go through a train and do it pretty thoroughly in half an hour?—Not and examine 100 odd pieces of baggage as well.

Q. But that was not part of your duty?—Yes; we examine the baggage.

Q. Did you make inquiries?—No; but we could tell who spoke English and who did not, and in that way we had an idea of what proportion were Germans or Norwegians.

Q. You would not be able to make more than a rough guess?—It could be done in that way, approximately, but it was never done.

By the Chairman:

Q. There is one point which I would like to have established pretty clearly. Your return was made to the Collector, but he used to change the numbers that you returned afterwards. Is that what I understood you to say—that he did not always publish the returns just as you sent them?—So far as I know, they were not interfered with, except that the other reports from outside ports in the district were added to mine, and the whole was sent to Washington in the statistical table furnished the Department.

Q. But your returns and the published returns are not the same?—My report was only the report from one point out of five or six in the district. They were all put together.

Q. The District of Huron embraces some five or six ports in all?—Yes.

Q. What proportion would Port Huron bear to the rest? Would the bulk of the passengers cross there?—Yes; the largest proportion of the passengers crossed at Port Huron.

Q. As your report only constitutes a portion of the whole, what, in your opinion, is the proportion of the whole volume of immigration which passed over at your particular point?—I should say it was only about two-thirds of the lot.

Q. So that the filling in of the report was two-thirds yours, and the other one-third was the work of somebody else?—Yes.

By Mr. Landry (Kent):

Q. Have you any positive knowledge that the figures you sent to Mr. Botsford were the ones, just as you sent them, that he used to forward to the Department at Washington?—I have just explained that Mr. Botsford compiled mine with the reports received from the other five or six ports in the district, and made one table for the whole district in his report to Washington.

Q. Yes; but what is your knowledge as to his making use of them correctly?—I have no knowledge of that.

By Mr. Bain:

Q. I presume Mr. Botsford returned your report to Washington along with those received from the other ports in the district?—They were all put together.

By Mr. Landry (Kent):

Q. If the returns for all the outports were put in one table and forwarded to Washington, the increase in the total number would be no indication of any change in your figures?—No; there might be an increase or a decrease in the other ports of the district, and that would affect the whole number, irrespective of any influence from my returns.

MR. G. N. MATHESON'S EVIDENCE.

HIS LONG OBSERVATION OF THE PROCEEDINGS—NEVER SAW NOR HEARD OF ANY COUNTING—CORROBORATES PREVIOUS EVIDENCE.

Mr. G. N. MATHESON called.

By the Chairman:

Q. You are Collector of Customs at Sarnia?—Yes.

Q. How long have you occupied that position?—Since July, 1874.

Q. Have you been accustomed to cross over in the trains on the ferry boats from Point Edward to Gratiot?—Yes; frequently. It is not my duty to do so, but I frequently have occasion to cross.

Q. Have you, on those occasions, ever observed any counting of the numbers of immigrants or asking the passengers or immigrants their names, ages, occupations and destination?—No; I never have.

Q. Or where they came from?—No; I never heard anything of the sort.

Q. Or whether they were returned United States citizens?—I never heard anything of the kind—absolutely nothing.

Q. If you have not seen such counting or registration, have you ever heard of such?—No; I never have.

Q. Do you think that your position would enable you to have known of such proceedings, if any such had taken place?—I think it would, at that particular point.

Q. You have known Mr. Irwin for how long a time?—Ever since his connection with the Grand Trunk—a period of about twenty years.

Q. Do you consider him to be a reliable man?—Thoroughly so—thoroughly reliable.

Q. How long do you say you have known Mr. Irwin?—I think fully twenty years. He knows when he first became baggage master for the Grand Trunk Railway at Fort Gratiot. He will remember the date; I think it is at least twenty years.

Q. You have never heard any statements that would shake your confidence in him?—No; I have always considered him quite reliable in any statement he might make.

By Mr. Paterson (Brant):

Q. When did it first strike you that the returns were made up very loosely at Port Huron?—I think about three or four years ago. I got a telegram from the Minister of Customs, asking me to go over to Port Huron and make enquiries. I went over and got copies of those returns from the Deputy Collector in charge at the office, and I sent them in. Up to that time I had never given the matter very serious thought, but when Mr. Lowe come up I paid more attention to it.

By Mr. Trow:

Q. When was that?—Probably three years ago. I could not give you the exact date.

Q. Did you have any correspondence with the Department in reference to this matter?—Well, no; nothing except personally between Mr. Lowe and myself.

Q. What prompted you to see Irwin?—Simply to get this information.

Q. But who prompted you?—I do not know that anyone prompted me in particular. It was a matter that I knew could only be had from an old employé of the United States Customs. It certainly could not be expected to be got from an official still in the employment of the Government.

By Mr. Paterson (Brant):

Q. When did you get it?—The date on the statement is November 5th.

Q. You are a Customs Officer at Sarnia?—Yes.

Q. It was not part of your official duty to ascertain the correctness of those figures, was it?—No; it was not.

Q. What led you to take such a lively interest in the matter?—Because I knew that our Department took a lively interest in it.

Q. What reason had you to know that the Customs Department took such an interest in the matter?—Because I received a telegram from Mr. Bowell, asking me to make enquiries. I made a report at the time; but we found out afterwards that unfortunately it could not be used.

By Mr. Hesson:

Q. I suppose that as a citizen of Canada you would feel it your duty to try to get at the truth in reference to this matter?—Yes.

Q. You knew that all parties in Canada were anxious to ascertain what was the reason we were losing so many people?—Yes.

Q. Would not that be an incentive to you to get all the information which your position would enable you to get?—Yes.

By the Chairman:

Q. Are you personally acquainted with that Deputy Collector of the United States Customs, who made a statutory declaration before you on the 18th of December last, touching the mode of taking immigration statistics?—Yes; I know him very well.

Q. Do you believe him to be a man of good character and standing, and worthy of credence?—Yes; he is thoroughly reliable. His name is withheld at his own request.

By Mr. Trow:

Q. Is he still in the employ of the United States Government?—No; as I remarked before, it would be no use to try to get that information from any person in the employ of the United States Government.

By Mr. Paterson (Brant):

Q. Did you give Mr. Irwin to understand that when you got that information from him it would not be used. I understood him to say that if he had known how far it was going he would not have given the information?—Well, of course I gave him to understand that it would be used, but I do not suppose he thought all the papers in the country would get hold of it and publish it.

By Mr. Trow:

Q. What part did he take in having these facts made public?—He did nothing at all about it. He did not know anything about the attempt to get this information till I brought him down the papers, some few weeks ago.

By Mr. Paterson (Brant):

Q. You knew that Mr. Lowe had been up there on this matter?—Oh, yes.

Q. Did you not converse about it with him?—Oh, yes, certainly; I conversed frequently with Mr. Lowe, and was with him a good deal, endeavouring to hunt this matter up and get all the information.

Q. That was in 1881, when Mr. Lowe was first up there?—I think it was in 1881, but I am not very certain. I did all I could to help him to get this information, but we found it very up-hill work.

By Mr. Fairbank;

Q. The Chairman has asked you how long you have been connected with the Customs at Sarnia, and I think you said for the last four years?—No, Sir; since 1874.

Q. Where were you previous to that time?—I was at Point Edward. I was a Landing Waiter in the Customs there, in the employ of the Grand Trunk Railway, from 1869 to 1874.

Q. While you were at Point Edward, would you have ample opportunity of seeing the passengers who crossed?—Yes.

Q. Do you allude, then, when you speak of your frequent opportunities for observing the methods adopted in crossing at that point for obtaining the number, solely to your experience as an officer at Sarnia, or do you include the time that you were engaged at Point Edward?—Oh, well, I might include that time in my statement too.

I think the impression was, that during all this period you have lived where the Grand Trunk crossing was, instead of at Sarnia, two miles below?—You may include the whole time in my statement. Of course, I had more occasion to cross in the early days, when I was Landing Waiter, than later, but there is seldom a day that I do not cross on some business or other.

By Mr. Hesson:

Q. Would it be possible for two or three men to take accurately the number of passengers and all the information you find in the U. S. return?—I think, taking an ordinary train, that three ordinarily smart men might go through and get that information, if they had nothing else to do, but if they had to examine the baggage it would be different. If they had nothing else to do they might get that information very nearly correct.

By Mr. Trow:

Q. What system would you adopt?—You would have to canvass the passengers, and ask them where they came from and other questions necesary to get that information.

Q. Do you consider that this information ever was obtained accurately at that point?—Oh, no.

Q. And I suppose it never will be?—Well, I do not know. If this sort of thing goes on, I think, some method will have to be adopted. I will read a report of an interview with the Collector of the U. S. Customs at Port Huron, which appears in the Port Huron "Telegraph" of March 8th, 1884. It is as follows:

"A Sarnia paper denounces, as only a Sarnia paper can, the Government of the United States as being a criminal liar. The cause of the trouble is this. On February 28th, Mr. Lowe, Secretary of the Canadian Department of Agriculture, appeared before a Parliament Committee, and declared that Chief Nimmo, of the American Bureau of Statistics had, in his last report, wilfully misrepresented the number of Canadian emigrants entering the United States at Port Huron. Mr. Lowe's statements were supported by affidavits from two discharged Custom House officers, formerly at Fort Gratiot, who say that there was no system of arriving at any correct result.

"Collector Hartsuff returned from Washington yesterday. Thinking that he might know more about that matter than Lowe's informants, a "Telegraph" reporter waited upon him last night.

'Has the Customs Department any system of arriving at correct figures in regard to the number of Canadian emigrants. I see it is said that the result published by the Bureau of Statistics is mere guess work,' said the reporter.

'I will only speak for my own administration,' said Mr. Hartsuff. 'The force at my command is such that I cannot place men at the Grand Trunk Railway crossing, for the sole purpose of gathering statistics, but during two weeks in every three months, careful officers are detailed to go through each car arriving, and ask every passenger where he or she is from, where bound, and with what intention. The officer carries a note book, and carefully takes down each answer. He is instructed to be very thorough. He reports only such passengers as answer his questions. In this two weeks, the number of Canadian immigrants is obtained accurately. During the rest of the time, the baggage of every passenger crossing is examined and noted. The officer can tell very nearly from the manners, talk, dress and baggage of the passenger whether he is European, Canadian, or American. The report of the officer is made from his observation, and may be safely taken, because the sum total of Canadian immigrants reported by him during two weeks, is less than that stated as arriving in a like time by the officer who, as stated before, reaches absolute certainty. Then special trains, or special cars on regular trains, frequently carry a large party of Canadian immigrants, and their number is easily noted. Foreign immigrants usually come in large parties, accompanied by an interpreter, who gives all the information desired. Although not absolutely correct, the official statement of Canadian immigrants is under, rather than over-estimated. Last spring I instructed the deputies to be as careful as possible, to be thorough and watchful, and always carry note books; but above all things never to over-estimate, since there was no object to be gained thereby. Chief Nimmo, himself, at that time sent me a letter, asking that exceeding care be taken not to over-estimate, because the Canadians, for political reasons, saw fit to deny the truth of his tables each year. Lowe claims that the number of passengers from Canada, crossing at Port Huron, is less than the number of immigrants claimed. I have the total number of cars that crossed, and will show that if the Canadian figures are right, only five or six passengers occupied each car. I am going to review the whole question in a few days, and will thoroughly confirm the truth of the Government Statistics.'

By Mr. Hesson:

Q. Do you, from your personal knowledge, know whether or not men were employed by the United States Service for two weeks in each quarter, as is stated in that interview?—I have never seen it done. I would not go so far as to say they do not do it, but I have never known it to be done.

Q. Would it be possible for it to be done without your knowing it?—I think it would be impossible for me not to see it if it were done.

By Mr. Landry (Kent):

Q. Have you never seen it done?—No.

Q. Have you gathered, from any other source than this report in the newspaper, that such a thing was done?—I never knew of it before. This is the first time I ever saw the assertion made.

By Mr. Orton:

Q. I suppose that statement is given upon the information or knowledge that that officer had acquired during the time he held office. How long has he been Collector at Port Huron?—His appointment, I think, was made last March, so that he has been about a year in the office. It is only since last March that he could speak of these facts.

By Mr. Hickey:

Q. You refer to Chief Nimmo?—No; I am speaking of General Hartsuff. He says he only speaks for his district.

By Mr. Paterson (Brant):

Q. When did his duties commence?—Last March—just about a year ago.

Q. When you went to get information, and sought it from former employees of the American Government, did you seek also to get information from those who

were actually employed in the United States service at the time?—Oh yes, I did, and I got the information, but I could not use it.

By Mr. Bain:

Q. Was it confidential?—Well, I did not regard it as confidential at the time, but I found out afterwards that it was liable to to do the party who gave it to me an injury, and it had to be witheld.

Q. How would it injure him?—It would affect him in his position beyond a doubt, and he would probably lose his place.

FURTHER EVIDENCE BY MR. LOWE.

BRITISH COLUMBIA IMMIGRATION—THE HAMILTON FIGURES.—LETTER FROM GENERAL MANAGER OF CANADIAN PACIFIC RAILWAY.

The CHAIRMAN. In reference to a question which was put to Mr. Lowe at our last meeting by Mr. Baker (Victoria), as to the number of immigrants who have gone into British Columbia during the past year, Mr. Lowe has handed me a memorandum compiled from Mr. Jessop's report, from which it appears that the number of immigrants was, in all, in round numbers, 9,000, of which 6,000 were whites and three thousand Chinese.

By Mr. Baker (Victoria):

Q. In connection with that statement I wish to ask if that is not an approximation merely, and if it is not stated to be an approximation, because I have reason to apprehend that there have not gone so many as 6,000 white people into British Columbia during the past year. I should be very much pleased to know that such is the case, but I am afraid Mr. Jessop's report, from the short time he has been at the work, is not very reliable. It is not from any fault of his own, but, as I have said from the fact of his having only recently undertaken the work?

Mr. LOWE.—Mr. Jessop became the agent of the Dominion on the 1st of January last. The report which he gives is that which he had made for the Provincial Government. The figures are in round numbers and, therefore, I infer they must have an element of approximation in them.

By Mr. Paterson (Brant):

Q. I see in the report of the 20th February, the number of arrivals at Suspension Bridge is put down as 2,641, as compared with 3,246 for the same period last year. I would like to ask Mr. Lowe how he arrives at those figures?—Those arrivals at the Suspension Bridge are reported by Mr. Smith, the agent at Hamilton, and he gets the figures from the information which he obtains at the trains, from the railway officials, and from immigrants reporting at his agency.

Q. Is the number of tickets taken?—The conductor may be consulted and tickets counted as respects Canadian immigrants having destinations beyond Hamilton.

Q. Is the conductor instructed to make a note of the number of passengers he has on his train?—I cannot tell that.

Q. Would it not be necessary to know that, in order to determine whether your figures are accurate; we are not indulging in guess work, too, are we?—I hope not.

Q. Then how would you answer that point? If it is not part of his duty to report the whole number, how would you arrive at the correct figures?—It is a voluntary statement of the conductor to the agent.

Q. How does he know it?—He knows it from the destination on the tickets.

Q. Does he keep a memo. of the number of tickets?—The agent keeps an account as they are reported from day to day.

Q. Is the conductor paid for that service?—No; but the agent is paid for doing his work.

Q. But the agent gets his information from the conductor, as I understood you to say?—He gets information from the conductor, but that is only one of his means.

The conductor knows what passengers he has on his train and the destination of the tickets.

Q. Does he keep a memo. of that?—I do not know.

Q. How does he ascertain that fact?—He knows what he has on his train.

Q. But he must keep a memo. of them in order to know?—I think a sheet for a report is made by every conductor of every passenger on his train.

Q. Then you think it is absolutely correct?—I think the information obtained by the agent may be accepted as correct. But "absolutely" is a very strong term; and I would say substantially correct. If there is any error it is an error of omission, as the agent only enters the immigrants he ascertains as being present on the trains, and he may not ascertain them all.

By Mr. Paterson (Brant):

Q. Is it not possible to arrive at the actual figures of passengers crossing at the Suspension Bridge; is there any difficulty on the part of the American officials learning from the conductors of the Grand Trunk Railway trains the total number of passengers on board for the different parts of the States?—There would probably be no difficulty if it were done.

Q. Would it not be a very simple thing to do; the United States Department could surely do it just as well as we do?—That particular information could be obtained in that way.

Q. And as I understand you, it would be precise and definite?—It would be definite as to destinations, if the destinations of all the persons on the trains were ascertained and entered.

Q. And as to the number as well?—Yes; but this is a question of dealing with immigrants from the steamers by the immigrant trains.

By Mr Hesson:

Q. Not the regular passenger trains?—I think, practically, the immigrants come on special immigrant trains. The bulk of through immigrants from the New York steamships come by special trains. But those immigrants for local distribution may come by local trains. On these trains, however, it would be very easy to distinguish immigrants from Europe from local passengers.

Q. You spoke to the Committee before of figures that were obtained in that way from the railway authorities, by taking the total number of tickets both ways, in and out?—The figures in that information were from the Traffic Auditor of the Grand Trunk Railway. Every ticket was included in that enumeration, and I think the only mode of finding the net immigration or emigration is to ascertain the difference between the total numbers of the ins and the outs.

By Mr. Watson:

Q. Do they keep an account of those going into and out of Canada at Suspension Bridge?—The tables I submitted to the Committee give the totals of the ins and outs at the Suspension Bridge. But this return of the agent does not represent any attempt to obtain any record of immigration and emigration at the point of Suspension Bridge. An ocean ship may possibly bring out a thousand immigrants. A very long train of those immigrants will pass Suspension Bridge, going to points in the west. On that train there will be a certain number of those immigrants, who came out in the ocean ship, who have tickets for places in Canada, and the agent of the Department obtains that information and gives a return of it.

By Mr. Bain:

Q. As well as of those that are passing through to the American side?—The agent takes the total numbers and they are tabulated in his report of the immigrants for Canada. This is as far as he can ascertain them, and he only takes those he ascertains.

By Mr. Paterson (Brant):

Q. The total of those who go to the United States are made up from the enumeration at the Suspension Bridge, as well as those that remain in Canada?—The totals of both are taken.

Q. That is obtained in the same way, I suppose?—I understand so. We should expect a good many immigrants to enter at that point, as all the steam lines to New York advertise the passage, and their army of agents have an interest to send immigrants that way.

By the Chairman:

Q. I hold in my hand a letter from the General Manager of the Canadian Pacific Railway, which I will read to the Committee. It is brought by Mr. Lowe, and addressed to the Minister of Agriculture, and reads as follows:—

"THE CANADIAN PACIFIC RAILWAY COMPANY,
"OFFICE OF THE GENERAL MANAGER, MONTREAL, 16th February, 1884.

"SIR,—In reply to your enquiry as to the total number of passengers, including children, arriving and departing from Manitoba by railway during the year 1883, I have to report that the number of arrivals was 61,426, and the number departing was 22,458. The latter figure, however, includes about 2,400 men going to Port Arthur to work on the Lake Superior section of the railway, and about 2,200 men returning to the States from our main line work, west. The greater part of all these workmen came into the country in 1882.

"I have the honour to be, Sir, your obedient servant,

W. C. VAN HORNE, "*General Manager.*

Hon. JOHN H. POPE,
"Minister of Agriculture, Ottawa.

By Mr. Bain:

Q. This refers to the total number of passenger traffic in and out of Manitoba?—Yes; it points out the difference between the ins and the outs, and it is corroborative of the return made by the agent of the Department at Emerson. The numbers given by Mr. Van Horne are a little larger than ours, but we have retained our own figures, which we have entered month by month in our office.

By Mr. Watson:

Q. Are these the whole of the Canadian Pacific Railway returns?—Yes; from all points where immigrants go into Manitoba. They include Port Arthur and Gretna.

By Mr. Paterson (Brant):

Q. Our return does not include immigrants coming in by passenger trains?—Oh, yes; all immigrants entering Manitoba.

Q. I am not speaking about the North-West now. I am referring to your February report. Do we never keep any account of those coming in by passenger trains?—I understand that only those passengers on regular trains who are returned as immigrants are specially reported as such at the agencies.

Q. Then our returns do not show us the total number settled in Canada?—We have always said that there may be very considerable numbers coming in and going out on the railways, of which no record can be obtained, but the return which I gave from Mr. Hawson, the Traffic Auditor of the Grand Trunk Railway, when I was last before the Committee, shows the movement on the whole of the Grand Trunk Railway system, including the old Great Western, and it is the most perfect report that was ever submitted. It includes the numbers going in and by regular trains as well as the immigrant trains, and the classification is such as to define the immigration and emigration.

Q. It does not appear in your statement of the totals?—The statment referred to, of the Department, is simply from the reports of our agents.

Q. This is apparently made up of the arrivals at the different ports?—Yes; as reported by our agents.

Q. Then they come in and an account is taken of each passenger through to the United States?—Yes.

Q. And the balance are presumed to have settled in the Dominion?—No; not that way.

Q. Well that is the way the statement is made up?—The statement gives, first, those who come as immigrants to Canada, and then it gives those who come as passengers through Canada to the United States.

Q. And you take the total number of passengers to the United States from the total arrivals, and the balance are presumed to have settled in the Dominion?—There is no relation to a balance—no subtraction.

Q. Yes; you must arrive at it in that way?—No; it is not arrived at by any method of subtraction whatever. There are two sets of statements.

The Committee adjourned.

PROFESSOR SCHMOUTH'S EVIDENCE.

AGRICULTURE IN THE PROVINCE OF QUEBEC—IMPROVEMENTS SUGGESTED.

OTTAWA, 21st March, 1884.

The Committee met, Mr. WHITE (Renfrew) in the Chair. Prof. SCHMOUTH, of St. Anne's, Quebec, called and examined.

By the Chairman:

Q. What is your name and occupation?—My name is J. D. Schmouth; I am Professor of the Agricultural School at St. Anne's.

Q. In the Province of Quebec?—Yes; in the County of Kamouraska.

Q. You have a pretty thorough knowledge of the Province of Quebec?—I have travelled over a certain part of the Province. I have seen the valley of Lake St. John, and the Counties of Kamouraska, Bonaventure and Gaspé.

Q. Are there large tracts of land in your region which would offer advantages to colonization?—There are very large extents of land, so far as my observation goes. I have seen in those parts of the country very large extents of land fit for colonization. We have the County of Temiscouata, where the land is very good, though there is not so much of it as in some other counties. We have also the Counties of Rimouski and Gaspé, but especially the valley of Lake St. John. We have an extent of land of first-class quality, open for colonization, which would form several parishes.

Q. What have been, up to the present time, the principal causes why these lands have not been more rapidly colonized?—The principal cause has been the lack of roads. There are other causes, but the principal cause is that there are no colonization roads, and especially no railways, to give greater facilities for the transportation of produce. It is the greatest impediment we suffer from, especially in the valley of Lake St. John. The climate is splendid, and the soil is of first class quality; but the want of roads for transportation is our greatest impediment to colonization. Last summer the yield of the various crops was very good, but unfortunately, owing to the want of roads, the farmers' produce had to be sold at a very cheap rate. Last fall the highest price obtained for spring wheat was 75 cents per bushel.

Q. In what locality was that?—In the valley of Lake St. John.

By Mr. Trow:

Q. Is there any particular point that you could name as being a particularly good locality—say Chicoutimi, or a little north of it?—A little north of Chicoutimi, there is a very good district. There we have the market of Chicoutimi, but it is a very small market, not sufficient to afford a market for all the produce of the Lake St. John valley. In summer we have steamboats running from Chicoutimi to Quebec, and then the market for these parishes on Lake St. John is Quebec.

Q. Is that the height of navigation? Are there not some falls there in the river?—There is Ha! Ha! Bay, on the Saguenay.

Q. How far is that from the Lake St. John?—We count it to be about sixty miles.

Q. And that produce has to be drawn at present to that point by carriages?—Yes. In spite of this long distance they sell in Chicoutimi in summer, but from the

beginning of winter till summer comes again, they can sell very little, because Chicoutimi is too small a place for that.

By Mr. Trow:

Q. Is there not a railway in contemplation from Quebec to Chicoutimi?—Fortunately, there is—not to Chicoutimi, but to Lake St. John. But there is one also in contemplation from Lake St. John to Chicoutimi. A company has been organized, and the county has subscribed a certain amount to help building that railroad.

By the Chairman:

Q. Has there been any considerable immigration into that region?—For the past ten or fifteen years we have had a pretty large immigration, but there is this about it, that it is only momentary; that is to say, the greatest part of those who leave our place, especially for the United States, return again. Entire families come down from the United States, leaving the factories there where they have been employed. They have left our districts especially to work in the United States. Some of them have sold their lands and have gone by whole families. Then there are large numbers of isolated single men, who work in the United States manufactories, or in its commerce and trade, or lumbering interests. But these people go to the States for the purpose of earning money in order to buy land, for their constant aim is to get money enough to buy some land for themselves. A great many of them have gone to Montana, in the western part of the United States, and the greatest number of them have come back with a certain amount of money, with which they buy land at home.

By Mr. Trow:

Q. What were they engaged in in Montana?—In cutting wood for mills and in getting out grinding stones. They get very high wages at that work—more than the cultivation of the land would afford them at home. I know instances where men have come back, after an absence of four or five years, with from $4,000 to $6,000 of earnings, and some of them bring back as much as $10,000. The opportunities are not so good now in Montana as they were some years ago, but they bring back enough to enable them to buy land for themselves in the Province of Quebec.

Q. Would they make $10,000 in cutting wood or in mining?—Cutting wood and carrying it. They were strong men and capable of earning good wages.

By the Chairman:

Q. According to your observation, are we to understand that the emigration from your section of the country has not been of a permanent character—that it has not materially affected the population?—It has affected the population, but they are coming back now to remain.

By Mr. Sprou'e:

Q. You mean to say that the men did not go away to remain away permanently?—No; they never intended to remain away. They only left for a while to make money. When they left our district it was a great injury to the country, because we wanted their work, but they are all coming back with the means to buy and settle on farms. A great many of them, too, were largely in debt when they went away but they are not so now.

By Mr. Campbell:

Q. I suppose some of the tracts of land that are available in your district for colonization purposes are not very desirable for settlement?—That is true in some districts, such as L'Islet, Temiscouata and Kamouraska, but you have to go to the Lake St. John for the best land for colonization purposes. In Kamouraska, L'Islet and Temiscouata especically, they have some land that is so poor and so rocky that it is hardly worth colonizing. It is a pretty large district; I cannot give the figures.

By Mr. Trow:

Q. Have you travelled extensively in the valley of Lake St. John?—I have travelled fom Chicoutimi to St. Felicien. It is a very long road, some 120 miles.

Q. Have you any idea of the extent of the arable land in that settlement? How many of your counties do you think are free from stone?—We have the Counties of Chicoutimi, Bonaventure, Gaspé, Rimouski and Temiscouata.

Q. The last mentioned counties are on the south side of the St. Lawrence?—Yes; on the north side we have only Chicoutimi behind the mountains; on the south shore we have Gaspé, Bonaventure, Rimouski and Temiscouata, but these, I may say, are not entirely free from stone.

Q. Is there any very considerable portion of it free from stone?—A considerable portion. The colonists prefer land free from stone; that is the reason why the valley of Lake St. John, County of Chicoutimi, colonizes more rapidly than any other part. The colonies also want good roads.

By the Chairman:

Q. You spoke of the climate of Lake St. John. Is it as favourable for the growing of grain as that of the country in the vicinity of Quebec and along the shores of the St. Lawrence?—It is more favourable. The Counties of L'Islet, Kamouraska, Temiscouata, Rimouski, Gaspé and Bonaventure, are very good for farming, but from my personal observation the climate of Lake St. John is still more favourable. In fact, they sow their grains and plants in the Lake St. John district a fortnight before we do; but, as in all new settlements, they are, during the fall, more subject to early frosts than we are.

By Mr. Trow:

Q. What is the latitude of the southern part of the Lake St. John district—49°?—It is about 49° and some minutes.

Q. It is 300 miles north of this, then?—It is more south than Gaspé, Bonaventure, Rimouski and Temiscouata.

By Mr. Cochrane:

Q. What time in the spring do they commence their spring work?—Towards the 1st of May. We don't begin generally before the 15th of May. Sometimes we can sow spring wheat in the month of April. Since I have been at St. Anne's, I have sown wheat myself on the 28th of April.

By the Chairman:

Q. I think you said that the opening of colonization roads and railways would tend to increase the colonization of lands in your section of country. Would it not also have a tendency to diminish emigration?—It is the general belief that if we could have more facilities for colonization it would certainly hinder emigration, because our people are attached to the land. Indeed, they are so attached to their land, that they sometimes colonize our back country, which is not fit for colonization. They like to see the steeple of their parish church, as we say.

By Mr. McCraney:

Q. Is there plenty?—Not very much. There was plenty, but now we have

Q. What kinds of timber grow there, and of what quality?—We have pine, principally spruce.

Q. Is it of good quality and size?—It is of very good quality. Mr. Price has limits and saw-mills there.

Q. Is there hard wood there?—Not much hard wood; the timber is mostly spruce, though we have a little birch and maple.

By Mr. Cochrane:

Q. In that kind of wood mixed with the pine, or do you find it in sections by itself?—In sections by itself. We do not find it with the pine. There is a reason for that; the ground fit for pine is not fit for hard wood; it is not even fit for spruce. Pine always grows in light soil.

Q. How do you find that soil for the cultivation of cereals?—In the sections where pine grows it is only sand, and is not fit for colonization. In fact, some people who colonized those parts first, left them to go a little higher, especially to St. Felicien.

By Mr. Trow:

Q. What encouragement has the Quebec Government given towards settlement? Do they aid settlement?—The Local Government made some roads.

Q. Do they give free grants of land?—I consider the terms almost free. The land is only 20 cents per acre.

By the Chairman:

Q. Would the extension of agricultural education be desirable as a means of rendering agriculture more prosperous?—Yes; I have been a professor in the Agricultural College at St. Anne's for these twenty-three years. We have not many colleges to teach agriculture, especially its practical part, and we cannot afford to take a great number of scholars. We have, however, ten per annum as a minimum. We have succeeded pretty well, and the greater number of farmers we have turned out have done very well. We have, in the valley of Lake St. John, some twenty of them, and they take a very good position in their respective localities. Some of them are members of agricultural societies, others are mayors, and public officers in good positions.

By Mr. Cochrane:

Q. What class of your population were these pupils from, mainly, were they from the agricultural portion?—Generally fromthe agricultural portion, though some of them were sons of merchants or men employed in some of the liberal professions. The greater part of them were farmers' sons.

By Mr. McCraney:

Q. Can you, in the valley of Lake St. John, grow apples, pears, plums and small fruits?—Apples can be grown, but not pears. Plums, gooseberries, strawberries, currants, and raspberries do very well.

Q. Do apples do well there?—Yes; they do very well; but the country is new and we have no very large orchards planted or bearing yet. We have a nursery in our region, which furnishes all the trees and plants we require, and some are sent to the Lake St. John district and they succeed very well.

Q. Have they been planted long enough to bear and to prove that they can be successfully raised there?—Yes.

By the Chairman:

Q What are the most important defects in our Canadian agriculture?—Generally among our people the principal defects arise from want of special agricultural education. Our people do not read enough, and they do not recognize the value of special education. It is for that reason that we try, in our vicinity, to encourage our farmers to send their sons to an institution where they will receive the education needed for their position. From this want of special instruction arises a good number of defects. For example, we have the question of fertilizers; generally our farmers do not know or do not estimate the proper value of fertilizers, nor have they sufficient practical knowledge to utilize many of the fertilizers at their command, which are now wasted. For instance, take ashes, which are now allowed to go to waste, and which if utilized, make a valuable fertilizer. We have on the shore of the St. Lawrence, also, very large and numerous fisheries. The tide advances and recedes regularly and leaves on the banks of the river large quantities of fish, which constitute a splendid fertilizer if properly treated. Some of our farmers even use fish in their natural state as a fertilizer, and with good results. Last summer I was employed in inspecting farms throughout the county, with a view to awarding prizes to the best managed farms. in the course of my visits I saw fields of potatoes, part of which were manured with common farm manure, and part with fresh fish, and there was a striking difference In the appearance of the crop. On the part that was manured with fish, the stalks were higher and of a dark green colour, while the other part, from the strong contrast, appeared to be quite yellow.

By Mr. Sproule:

Q. What is the best way to prepare fish for manure?—It is generally used among our people in itsnatural state, but any statement I might make as to the mode of preparing it would be simply a theory.

Q. That would do very well?—In its natural state it does very well, but it would be better if it were prepared. In some countries, especially in France, they prepare the fish with lime, in order to neutralize the varied oils.

By Mr. Cochrane:

Q. How would it do if there were a compost made of barnyard manure and fish?—On our farm we do something of that kind. We make a bed of a certain depth, of

common manure. Then we add the fish and work the two. The system does very well.

Q. What do we understand by your statement that your people will not be educated up to agriculture? Are they slow, as a general thing, in adopting improvements?—It is just that. They are slow in adopting improvements, but whenever an improvement has been tried and proven, they take it up. I have an illustration of that. Twenty-three years ago, when I came to that district, it was not the habit of farmers to sow grass seed for meadows. We did it on our farm of 416 acres in area, and the farmers, having seen the results of that improvement, took it up. It took seven or eight years, however, to push it.

Q. Has your Local Government ever adopted the principle of employing lecturers to address agricultural societies on agricultural topics?—They have lecturers going to various places, but they are not numerous enough.

By Mr. Sproule:

Q. Do you ever mix this fish manure with the common black muck for fertilizing?—Not in every place. It is only done in places where we have that *terre noir*. We have no such *terre noir* at St. Anne's but in the adjoining parishes they have some. I saw that system followed last summer at River Ouelle. It did very well.

By Mr. McCraney:

Q. In using fish for manure, do they take the whole fish or only the entrails of the fish?—Sometimes the fish taken in our fisheries are very abundant.

Q. So abundant that they are no good?—We take all the fish we want for food, and the rest they use for manure.

Q. Would not the fish be worth more than the crop you get from the soil? Could you not sell the fish?—No; we could not.

Q. What is the name of the fish?—The smelt.

By Mr. Sproule:

Q. Are these fish caught, or are they washed up by the waves?—They are sometimes washed up by the waves.

By Mr. Blondeau:

Q. Don't you think that if we had a place to freeze them, we could sell them in the market?—We could sell a part of them, but not all.

Q. Suppose they were frozen, and shipped to New York, could they not be sold there? They do that in St. John, N.B.?—I don't know whether it is a fish capable of being kept.

Q. They preserve them at St. John, New Brunswick, do they not?—I know they make sardines.

By the Chairman:

Q. Is there much waste in fertilizing substances on our Canadian farms?—There is a great deal. Part of the fertilizer given by our cattle is wasted. Our farmers generally use the solid matter, and leave the other, or liquid part, which is certainly a very good fertilizer unused. Even the solid fertilizer, before it is used, loses many of its qualities by the washing of the rain, and it is dried up by the sun. Our farmers permit that for a certain reason; they believe that fresh manure would bring to their ground a great quantity of weeds. This is true, but if they resorted to the growth of root crops, these would free their fields from the weeds. Then they could use cow-dung, fresh in its natural state, and a great waste would be avoided. They also waste their ashes, as I stated a while ago.

By Mr. Kirk:

Q. Would not keeping this manure under cover prevent this waste?—It would, certainly. On our farm we have built lately new stables, and under these stables are built cellars for keeping manure. We certainly waste nothing.

Q. Is it better to use stable manure fresh, or after it has lain for six months?—It depends upon the ground. For light ground we find it more advantageous to use rotten manure, because the ground is already too light, and if we place strawey manure on it it would leave it open. On our heavy ground we prefer the fresh manure, because it opens it. Such ground wants to be lightened.

By Mr. Cochrane:

Q. You speak about using manure fresh. Do you object to what we call the heating process, which is brought about by piling it, and will kill all the seeds?—I would not object to it providing there would be no waste by the operation, for example, if we cover the upper part with some heavy earth, or with straw or plaster, it will prevent the escape of the ammonia.

Q. What depth of a covering of plaster would be required to prevent this evaporation?—Very little, because plaster does not only act as a covering, but it produces a chemical transformation.

By Mr. McCraney:

Why would not earth or loam be just as good?—Loam acts only as an absorbent, whilst with plaster, being a sulphate of lime, there is a transformation; that is to say, the carbonate of ammonia produced by the manure is combined with the sulphuric acid, and is transformed into sulphate of ammonia, and the sulphate of ammonia is volatile.

By the Chairman:

Q. Would it be advantageous to use sea plants as well as fish, as fertilizers?—In my place we have no sea plants, but in Gaspé and Kamouraska we have them, and they are used there largely for different crops. They are used for potatoes and also for different grains, but before being used they must be decomposed or rotted.

Q. What preparation would it be convient to apply to fish and their offal in order to render them fit for immediate use and for exportation?—For immediate use I have given the means, which are to mix it with lime in order to neutralize the oils that are in it, or to mix it in beds with common manure and then with common earth. By putting these fish and offals in beds and mixing after a certain time, we can double the quantity of our manure, and have a quality better than the common cow-dung. But these are not the methods of preparing it for exportation. In my opinion the only way to render it fit for exportation would be to dry the fish, which would require a certain capital and a special business organization.

Q. Would not that, to some extent, neutralize the fertilizing properties of the fish?—If it were done properly it would not. The drying of fish takes away only the moist part.

Q. It does not affect the oils?—No; though perhaps it would be a little harder to transform it into the constituents fit for nourishing the plants.

Q. Would it not be a very expensive manure prepared in that shape—much more expensive than the ordinary mineral fertilizers?—It would not be more expensive. It does not act in the same manner as mineral fertilizers Mineral manures do not give to the plant the nitrogen we find in the fish.

By Mr. Cochrane:

Q. You were speaking sometime ago about the waste of manure, so far as ashes were concerned. What are the different effects of leached and unleached ashes?—Leached ashes possess a great number of constituents good for nourishing and feeding the plant. In leaching we have taken away the important ingredient called potash. We generally calculate that fifteen bushels of natural ashes are worth as much as twenty-five bushels of leached ashes from which the potash has been taken.

Q. Do you find any difference in the effect of ashes upon different soils?—Not upon different soils.

Q. Would you think ashes would be as beneficial on heavy clay as on lighter soil? Have they not a tendency to make hard land harder and heavy land heavier and closer? You said a little while ago that you preferred rotten manure for light soil, because it does not loosen it, and fresh manure for heavy soil to make it lighter. Do not ashes have the effect on heavy land of making it more compact?—I think your question would be applicable as well to leached ashes as to natural ashes. I have noticed, if I am not mistaken, that ashes render heavy soil a little lighter, whilst they render the light soil a little heavier. I account for it in this way. The grains of the ashes were a little bigger than the grains of the heavy soil, and smaller than the grains of the light soil.

By Mr. Guilbault:

Q. Have you visited the County of Three Rivers?—No. I have visited Quebec and Montreal. I lived in Three Rivers until I was eighteen. I was three years in Montreal.

By Mr. McCraney:

Q. Is the valley of the St. John well watered?—Yes. On all sides of Lake St. John are some pretty large rivers.

Q. Is there plenty of fish there?—Yes; fresh-water fish.

By Mr. Coughlin:

Q. Have you any live stock on your farm?—Yes, Sir.

Q. What loss have the farmers of your Province sustained by not feeding their stock properly?—On our farm we raise fine stock, especially the Ayrshires. We have also grades.

Q. How do the farmers do?—They are constantly endeavouring to improve their breeds, and our society of agriculture encourages them in this direction in every possible way.

Q. Still there is a great deal of poor native stock there yet?—Yes; there are Canadian cows there. They are pretty good for their yield of milk.

Q. But not for beef?—They are very poor for beef; they are too bony.

By the Chairman:

Q. In your region, in what condition is fish utilized, and what are its effects on vegetation. For instance, does the use of fish as manure, in any way, give a fishy taste to vegetables, and does it affect the milk of cattle fed upon pastures manured by fish?—I have thought so several times; last fall I ate some potatoes raised on fish, and I did not find that oily taste I feared. The potatoes do not get the taste, provided they are not planted in immediate contact with the fish. We do not mix the seed potato with the fish. We place first a fish, and then a potato, then a fish and then a potato, and so on.

Q. You do not place the fish in immediate contact with the plant?—No; or the plant would get an oily taste.

Q. Would it have a tendency to affect the milk of cattle, fed on pastures manured by spreading fish over them?—No; provided the fish were ploughed in; but if the fish were left on the top, it would.

Q. Fish cannot then be advantageously used as a surface manure?—It cannot.

By Mr. Blondeau:

Q. What do you think of our climate for fall wheat and fall rye? Do you think our climate is suited for them?—I have sown fall wheat.

Q. And with what result?—It succeeded well; but it is not cultivated generally. I think that will not always be the case; but the year I made the experiment, it was not ripe in time to furnish seed for the next year's sowing. We are obliged to sow fall wheat in the beginning of the month of September, and it only becomes ripe in that month the following year.

By Mr. Cochrane:

Q. You cannot get it matured for seed for the next year?—The sole experiment I made was not conclusive that such was the case.

By Mr. Blondeau:

Q. Did you try rye? - Yes, and it succeeded well.

Q. Did you try it on low land, or high land?—On high land, as I did the fall wheat. I would not have taken the risk of trying it on low land.

By Mr. Cochrane:

Q. What effect would salt have on wheat that ripens too slowly? How does salt answer as a manure?—We use salt only in the common manure. Theoretically, I know that salt in small quantity is a good manure. We have the results of experiments made in other countries, to show that in small quantities it is good.

By Mr. Coughlin:

Q. How much salt per acre do you put on the land?—Three-quarters or half a bushel.

By Mr. Blondeau:

Q. What sort of grain do you grow in your district?—Oats especialy, and spring wheat, barley and peas; we have not much land for peas; then we grow potatoes and mangolds, and last summer we raised 3,600 bushels of turnips on our farm.

By Mr. Coughlin:

Q. At what time in the year on the land?—Theoretically, I would recommend that it be sown before the land is harrowed.

By Mr. Blondeau:

Q. On the farms you visited last year, did you notice any improvements?—Yes; I did; especially in regard to manures. All the farmers who were engaged in this competition for prizes, I found, had adopted improved systems of treating their manures, by making what they call composts of first manure, mixing cow-dung and black muck together.

Q. Did the Government or anybody give bonuses for the best quality of manure?—The Agricultural Society offered rewards.

Q. How much did it give?—They did not give a reward especially for manure, but they offered a certain number of points for each branch, and for manure they gave ten points. If all the branches of farming are as well kept, they receive a total number of points, and the highest total would get the first prize, which was $50. There were five prizes, the second $40, the third $30, the fourth $20, and the fifth $10.

Q. There were five prizes offered for the county?—Yes.

Q. How many farms did you visit altogether?—I visited eight. I visited some other farms for my own information, but for the Society I visited only eight.

Q. And you gave five prizes among the eight. Were you in all the parishes in the county?—No.

Q. How many farms did you examine in one parish?—In Kamouraska, I examined six.

By Mr. Sproule;

Q. I believe you examined the farms of all those who entered the competition?—Yes.

By Mr. Blondeau;

Q. Were you not instructed to examine all the farms in every parish?—No, Sir; only those which competed; but for my own information I examined some others.

Q. I understand you were employed by the Society?—Yes.

Q. And this Society has members in every parish in the county?—Yes.

Q. And you had not orders to examine farms all over the county?—No, Sir.

Q. So that some of the members were deprived of the opportunity of competing for the prizes?—Yes; some of the directors even were deprived of the opportunity to compete, because they had not expressed a desire to compete.

Q. Whose fault was that?—They did not ask to be allowed to compete; they had to make application and pay a certain fee for entry

Q. But I understand the members of the society do not want to pay to have their farms examined; they pay their annual fees?—But this is a special prize given for the best managed farms, and the entry fee was $4.

By Mr. Cochrane:

Q. Have you adopted a rotation of crops on your experimental farm? Can you raise clover there?—We do, Sir.

Q. Do you think it is possible to keep up the fertility of the soil by a rotation of crops with clover and without artificial manure? Could you take a certain portion of your farm and seed it down with clover, then break it up and sow cereals on it, and then seed it down again. Would that rotation keep up the fertility of the soil without artificial manure?—There is a great deal of manure in the roots of clover, and where it does not come too often the clover gives sufficient manure for a certain time. But as a general thing I do not think it would be sufficient. On our farm we take a nine years' rotation, which is composed thus: The first year root crops, with manure; the second year we sow cereals with seeds of clover and timothy; then we

have four years of meadow, and then pasture for two years. The last year, the ninth year, we grow cereals, generally oats, to be followed again with a root crop.

Q. And you manure again?—Yes; when we undertook that rotation of crops our land was very poor; but it has improved continually during the whole twenty-four years that we have been following that course.

By Mr. Farrow:

Q. I suppose that would depend upon the amount of manure you keep adding year after year? You say your ground has improved, but no doubt it would be on account of the fertilizers you have put into it?—Certainly.

By Mr. Coughlin:

Q. Do you only manure once every nine years?—Yes; but we have only two years of cereals.

Q. Do you ever plough down any green clover?—No, Sir; we have ploughed it down only in pasture.

Q. You never allowed it to grow up for the purpose of ploughing it down as a green crop?—No; we have no experience in that line.

By Mr. Ferguson:

Q. This is an important question. As I understand, when land becomes poor for grain-producing purposes, it is because it is depleted of the potash elements of the soil. Now, these are not restored to the soil by any broad leave crop. Such crops merely absorb a certain amount of nutriment from the atmosphere, which goes to make up vegetable material, but does not add any potash to the soil. Without additional manure no rotation of crops can restore the fertility of the soil. Is that not your opinion?—Yes; according to our theory.

Q. That theory is useless unless it can be reduced to practical and beneficial results?—Yes; this theory has been established by other experiments than our own.

Q. Then you are of the opinion that no soil can maintain its original maximum production unless the lost material in the soil is restored by some means aside from natural means?—Yes; because these plants take from the atmosphere only the gaseous elements, while the mineral elements are taken from the soil.

Q. And must be restored by artificial means?—Certainly.

By Mr. Farrow:

Q. I want to ask a question here with regard to the value of clover roots as manure. Did you ever make a chemical analysis of the roots of clover?—No, Sir; not personally.

Q. I suppose you are aware of the ingredients contained in the roots of clover?—Yes.

Q. I am given to understand that in an acre of clover roots you will find as much nutriment as if you went to a merchant and purchased $50 worth of fertilizers of various kinds; in other words, that there is $50 worth of nutriment in an acre of clover roots?—I have made another calculation. I have never calculated it in that way. But from the knowledge of the constituents of clover roots, from analysis, I can calculate that the quantity of fertilizing material given to the soil by an acre of clover roots would be worth about twenty-five loads of common dung. Now, as to the value of that in money, I can say——.

Q. That would prove my theory to be correct, because a load of common dung is worth $2?—As to the worth of that in money with you, I cannot say, but twenty-five loads of dung in our place is not worth more than $5.

By Mr. Sproule:

Q. But you still think there are chemical elements wanted in the soil which are not supplied?—If we value the common dung by its richness in nitrogen, it is worth more than $5; but from a commercial point of view, it is not worth more than that. For the benefit of the land it is certainly worth more; otherwise, it would not be worth while to place it on the land and go to the expense of ploughing it in.

By Mr. Watson:

Q. Do you say that one acre of clover roots is only worth twenty-five loads of manure?—Yes; that is to say, it is equal to one-third of the manure required. We generally put seventy-five loads to the acre—one-horse loads.

By Mr. Cochrane:

Q. Have you ever tested to see when there is the most plant food in the clover roots? Is it after you have got a crop of hay off, when it is green, or when you have let the seed mature?—According to analysis, as well as reasoning, there must be always more fertilizing properties in the roots of clover before it has given seed than after that time.

By Mr. Ferguson:

Q. Do I understand you to say that any of the mineral elements can be produced by growing clover?—There are certainly mineral elements in the ground which are inert.

Q. Exactly. Then the clover produces nothing; it only absorbs forces already in the soil?—Yes; and gives action to those inert substances.

Q. But it actually adds no new mineral elements?—No; it gives inert substances force and action. It renders them soluble, for instance.

MR. J. E. TÊTU'S EVIDENCE.

IMMIGRATION TO MANITOBA.

Mr. J. E. Têtu called and examined.

By the Chairman:

Q. What is your employment?—I am Immigration Agent at the points of Emerson and Gretna.

Q. How long have you been employed in that capacity?—For the past eight years.

Q. Have you a thorough knowledge of the movements of immigration into the North-West and Manitoba?—I have, so far as going into the country is concerned; after that, of course, I lose sight of them.

Q. Do you take any means to ascertain the number going into the country?—Yes.

Q. What means are adopted?—We have a man who lives at Emerson and goes up to St. Vincent to meet the train. He then comes down with the train and takes the number of the passengers on the way. I know, from the way the work is done, that the figures can be relied upon. We opened at Gretna on the 13th April last. We also take an account of those crossing at Neche.

Q. Do you make any enquiries of persons going in as to their destinations, and their intentions of settling in the country?—Yes, to a certain extent; but what we look after principally is the exact number.

Q. You make your returns to the Department of Agriculture here?—Yes.

Q. Are those returns correct, according to the best information you can obtain?—Yes; I can swear to them.

Q. I see that by a return from Gretna, dated 29th February last, signed by you as Dominion Immigration Agent, you state that the number of souls who came in at Gretna as immigrant arrivals was 305?—Yes.

Q. And you divide that number into 13 from Nova Scotia, 27 from Quebec, 86 from Ontario and the Eastern States, and 179 from the Western States. By what means do you obtain the information under which you make this classification?—I have been sick since 27th December, and so have not been actually engaged with work since that time, but we have from fifteen minutes to half an hour in which to to do our work, after the arrival of a train. We go through the train, looking for baggage and taking the number of the passengers. With regard to nationalities, we have to learn of that as quickly as we can, and obtain all the information possible, but as to the figures giving the total number who went in at those points, there is no doubt as to their correctness.

Q. But the aggregate number is correct?—Yes.

Q. But you do not state positively that the sub divisions are correct?—No, Sir.

Q. You adopt the best means in your power to ascertain the locality whence the immigrants come?—Yes.

By Mr. Watson:

Q. Do you keep an account of the people going out of the country?—No.

By Mr. McCraney:

Q. What means have you of knowing whether the people going in are immigrants or transient travellers?—We know what comes through the Customs, besides allowing for a floating population of from 17 to 20 per cent.

Q. I suppose in travelling from Gretna to Neche you travel on a passenger train coming back?—Yes.

Q. And from Emerson to St. Vincent you go on the passenger train?—Yes.

Q. Then you would have a pretty good chance of knowing how many passengers come out of the country, compared with those that go into the country? Is there a great deal of difference between the number of passengers coming in and the number coming south?—As I remarked last year and the year before, when the railway work was stopped there was a large emigration of railway men, who had come from Wisconsin and Iowa, and we kept no special count of them.

Q. These were men who had gone in to work on the railway?—Yes. There was a good deal said about emigration at one time, but the people who were going out were from Iowa and Wisconsin; they were returning home from their work in the fall.

Q. What is your opinion as to the number of Americans who have gone across the line as settlers?—Since 1880, that would be for the last four years, there has been a heavy immigration from the different parts of the United States, especially from the Western States: that is an undeniable fact. In fact, right on the frontier at Emerson, and further up, the people are mostly Americans.

Q. On the frontier at Emerson the people are nearly all Americans?—For the most part.

Q. What population is there across from Neche, with the exception of the Mennonites?—There are only a few houses there.

Q. So you are of opinion that a large number of American citizens have settled on our side of the line in Manitoba?—Yes.

By the Chairman:

Q. What you mean by American citizens is people who come from any portion of the Western States?—I mean people who have come through the Customs, people who come from the Western States.

By Mr. Orton:

Q. Were not a number of those Canadians who had settled in the Western States?—Yes; a good many of them.

Q. They thought Manitoba a better country to settle in, and so they left the States?—Yes.

Q. I want to know whether there is not a number of Canadians coming over from the United States, persons who have settled there, and have found that it was not so good as Manitoba, and have sold out and come to Manitoba?—Yes; especially during the past year. There is, right on the frontier, on the west side of the Red River—on the Dakota side—a large Indian reserve. Four years ago, the people going to Manitoba went there, but for the last year or so they have been leaving on account of the American Government making them feel that they should not remain on the Indian reserve.

By Mr. Watson:

Do I understand that a great number of people who went there came from Manitoba to settle there?—No; they settled there when they settled first.

By Mr. Bain:

Q. And now they are moving out, because they cannot get a title to their land?—Yes.

By Mr. Hesson:

Q. Is it possible that any large number, or even a small number, could remove back from Manitoba to Dakota without being observed?—There is such a movement on the frontier often, but it is not large.

By the Chairman:

Q. I understand that an allowance of 17 per cent. is made on those parties whom you return as immigrants into the country, on the ground that they may be a floating population likely to go out again? From your observation—I suppose you have had an opportunity to notice the outward movement—do you believe that percentage to be tolerably near the mark?—From 17 to 20 per cent. is perfectly correct.

By Mr. Hesson:

Q. Do you count them in the first place?—We count every one.

By Mr. McCraney:

Q. Do you count every one going into the country?—Yes; except those that we expect to leave the country.

Q. I suppose you are aware that there has been a large number of transient travellers going into the country? Are you sure that only 17 per cent. go out?—From 17 to 20 per cent. we strike out.

Q. You generally count the regular travellers from Toronto or other places, who do not go in for settlement, and then you strike off 17 per cent.?—Yes.

Q. What reason have you for leaving out 17 per cent.?—It is the result of observation.

By Mr. Watson:

Q. How do you know whether those people are transient travellers or not?—We know from the Customs whether they have through freight or not.

Q. Well, a great many people go in there with nothing but a trunk. They may be going in for a month or to stay all their lives?—We count them as settlers.

Q. How do you know what people to leave out of your count when you are counting the people on the train; I understand you count every man, woman and child on board?—Yes.

Q. And then you deduct 17 or 20 per cent. as those whom you expect will go out of the country?—No.

By the Chairman:

Q. I would like to know whether my understanding of this matter is correct or not. When you make your first count you leave out those you know to be only transient travellers?—Yes.

Q. You don't include them in your count?—No.

Q. Then from the balance of those you do include in your count you make an allowance of 17 per cent.?—From 17 to 20 per cent.

Q. As people who do not intend to remain in the country?—Yes.

By Mr. McCraney;

Q. How do you know whether they are transient travellers or not?—We know from the Customs.

By Mr. Watson;

Q. There is one question I would like to get answered. I understood you to say that you count all the passengers coming across the International Boundary line into the Province of Manitoba?—Yes.

Q. You count them all—every man, woman and child?—Yes.

Q. Then you make that deduction of from 17 to 20 per cent. for people whom you suppose do not intend to stay?—Yes; but outside of that I leave out the regular passengers.

Q. I suppose you go into the Pullman car?—Yes.

Q. And you count the immigrants there?—Yes.

By Mr. Hesson:

Have you attempted to interview people as to their destinations, and as to whence they come, and what sort of courtesy do you receive?—Sometimes people will give us an answer, but when they land at St. Vincent they are too busy looking after their baggage to answer.

Q. You can get information on the train, more readily than at the station?—On the train it is easier to find where they come from, but when they come from the United States, we can tell through the Customs.

Q. A system of enquiry would not be as satisfactory to the general public. Suppose a sufficient number of men were placed there to get that information, would it not be objectionable?—Some two or three years ago we were working between Glyndon and Emerson, 153 miles, and we checked them on the road. That was kind of outside work.

By Mr. Watson:

Q. I think it would be a good thing if men were placed there to go through the cars and find out the nationality of these people?—It was done for three or four years, until a year ago; but we are pretty well posted now; we know the people.

The Committee adjourned.

MR. R. W. WHITE'S EVIDENCE.

NORTHERN ONTARIO—UPPER OTTAWA—GERMAN SETTLERS—SUITABILTY FOR SETTLEMENT—GRAPES RIPEN—CROPS AND MARKETS.

OTTAWA, 22nd March, 1884.

The Committee met, Mr. WHITE (Renfrew) in the Chair.

Mr. R. W. WHITE, of Pembroke, called and examined.

By the Chairman:

Q. You live in the northern part of Ontario?—I do; in the County of Renfrew.

Q. Are there large areas of free grant territory there?—Yes; in the southern and western part of the county.

Q. Have they been settled to a considerable extent?—Some portions have.

Q. Is a large portion of the free grant territory there fitted for settlement?—I imagine there would be 50 per cent. anyway.

Q. What is the character of the soil, generally speaking?—The country is broken; there are rocky formations sticking out through it, but in the valleys between, the soil is of first-class character.

Q. From your observation, what classes of settlers are most likely to succeed on these lands?—The Germans and the Swedes have succeeded best. They appear to be able to practise greater economy and to get along better than English-speaking people. Many of them have gone in and settled upon lands supposed, ten or fifteen years ago, not to be fit for settlement; these are now well off, and are buying out many of the English-speaking settlers in the older districts.

Q. Is the district fitted for stock-raising to any extent?—Apart from the length and the severity of the winter, which characteristics are common to this part of the country, it is admirably adapted to stock-raising. The grasses are exceedingly nutritious and the cattle that are turned out in the spring, almost unable to stand, recuperate within a few weeks and make good beef. In fact, the cattle become exceedingly fat in the fall. The amount of broken territory gives them a very large run, and on all this broken land the grasses are very nutritious.

Q. Is the country well watered?—Yes.

By Mr. Trow:

Q. Are the winters very severe?—Not more severe than they are here.

Q. I suppose the stock undergoes partial starvation in winter?—No; not exactly that.

By Mr. Kirk:

Q. About what time in the spring do the farmers generally begin to sow or plant?—The seasons vary, of course, but the farmers generally begin their farming operations in the early part of May.

By Mr. Coughlin :

Q. Were those lands heavily timbered?—Yes; with white and red pine, and in some portions they were heavily timbered with hard wood. Some of the hard wood lands there are still heavily timbered; but the hardwood lands are not always the best. They are generally very stony.

By Mr. Trow ;

Q. Is it very difficult to remove the stumps?—It is sometimes difficult; but still it can be done with the appliances they have.

By the Chairman ;

Q. What appliances are used principally?—They extract the roots with the tripod screw and horse power. In clay soil it costs very little to take out the stumps, because the pine roots, instead of penetrating the soil, run over it. In lighter lands they run down and the work is heavier.

Q. Can any use be made of the stumps when extracted?—They make the best, the most lasting and the most impenetrable fence that can be put up. Many farmers, by setting them up on their sides and trimming them off, make not at all unsightly fences, and very good and durable ones too.

By Mr. Trow :

Q. Is the land obtainable in tracts large enough for communities to settle upon; that is, can you find a township that is good throughout, or is the good land distributed here and there?—Where you have a township well fitted for settlement you generally find some portions of it that are not good. The bad lands, however, are sometimes in a tract by themselves. The worst land we have there is sandy land—a light, sandy land. The fertility of the soil where the land is rocky and strong is sometimes surprising, but it is a little difficult to cultivate. Still the Germans and Swedish settlers do not appear to find much trouble on that score. I fancy they are accustomed to that class of farming, from the nature of the country they come from.

By Mr. Sproule:

Q. Is the broken land good for agricultural purposes?—It is perfectly marvellous to see the rapidity with which animals put out to graze on that land will (the country people call it "lifting" recuperate. They will recuperate in a few weeks on the grass grown on that rocky soil. The grass is dry, and apparently exceedingly nutritious. A good deal of it partakes of the character of bunch grass.

By Mr. Coughlin ;

Q. What is the character of the rock? Is it limestone?—The character varies. Lime creeps out in some places; but the rocks are mostly of the Laurentian formation.

Q. Do they form very high hills?—They are not exceedingly high in our county. The highlands are on the north shore of the Ottawa. The lands there are very high, and, of course, valueless. Still, in our locality, I have seen splendid farms on the top of the hills, and settlements in most unlikely places.

By Mr. Sproule :

Q Is the country well watered?—If you were to look at a map of that country you would find it filled with streams and lakes, like the face of a man after smallpox.

Q. What is the quality of the water?—It is magnificent; there is no question about that. Of course you occasionally find a muddy lake, but the majority of the lakes in our county are clear lakes and the water in them good.

By Mr. Hesson :

Q. What extent of unoccupied land have you there?—There would probably be a tract of land twenty by thirty miles.

Q. Equal to about six townships?—Yes. There are of course a few settlers scattered throughout this portion of the county and the extension of the railway is taking others in.

Q. The timber is mostly gone?—Yes; in our county.

Q. How do the lands sell there?—Most of the lands in the district I speak of are free grant lands. They are held by the Government and are given as free grants, with conditions of settlement.

By Mr. Trow:

Q. What means of communication have you to those lands?—The Canadian Pacific Railway, from here, passes right through the county from one end to the other. There are a good many colonization roads, and a good deal of colonization road money is being spent there, year after year, in improving the roads in that portion of the country.

By Mr. Sproule:

Q. Are there good mineral deposits in the county?—Yes; in the southern part of the free-grant district, there are immense and exceedingly valuable deposits of phosphates that have been discovered. There is a good deal of prospecting going on for minerals, and I have no doubt that there are large deposits of other minerals there. The country is next to the Madoc region In fact, it abuts upon the County of Addington, and the country is of the same character as Addington.

Q What sort of minerals are found in the district adjoining?—Iron at Marmora; gold at Madoc. Phosphate mining, though, is the leading mining industry of our county.

By Mr. Coughlin:

Q. Is the quality of the soil in the southern part something like that in the northern part of Addington?—Yes; something the same.

By the Chairman:

Q. What effect has the extension of the railway throughout the county had on the settlement of the county?—The railway has taken in a great number of people who have taken up land. These are not immigrants, but men who have had work on the railroad and are now settlers along it, wherever they think they can make a good farm. Away in the direction of Lake Nipissing there are considerable quantities of land reported to be fit for settlement.

Q. Is there a large settlement there?—Yes, on the South River, south of Lake Nipissing. Although I have not been on the north side I have been informed by gentlemen lumbering there that there are very large tracts of hardwood country there, with a very small percentage of stumps.

Q. That is north of Lake Nipissing?—Yes; where the railway runs, and before reaching Sturgeon River.

By Mr Sproule;

Q. How far does that extend back? How far does the good land extend back?—Along the Mattawa River there is good land, and a large number of settlers are going in. On the Mattawa, where the road turns from the Ottawa, between Mattawa and Lake Nipissing, large numbers are going in through the agency of the railway. Probably they would not have gone in there but for the railway.

Q. What is the character of the timber back of Lake Nipissing?—It is very good. I have seen a great deal of it that has been brought down by rail.

Q. Is it pine?—Pine; although, as I say, there are large tracts of birch and maple of the finest quality. The major part of the timber used for commerce is white pine.

By Mr. Trow;

Q. Does that Laurentian Range run east and west?—It runs almost across the continent. After reaching the Ottawa, at Montreal, it follows the course of the Ottawa River, in some places receding quite a distance and leaving a tract of good land between the mountains and the river, and in other places, as just above our town of Pembroke, coming right up to the river. Thence it follows the river on its north shore to Lake Temiscamingue.

Q. Are the passes between the settlements very difficult for road making?—Pretty difficult. Of course, I am speaking now of the Laurentian Mountains, on the north side of the river. On this side of the river we have not the Laurentian range at all; we have merely the outcrop, consisting of small spurs.

Q. The spurs do not rise to the same height?—Not at all; and they are of the same character.

Q. What is your opinion of the durability of the soil, particularly of the stony land?—Where the land is light on stony soil, it certainly will not last. My experience has been that where a farmer takes up a stony piece of land, and clears it pretty well, he can always make a living off it, that the land has always staying powers and qualities, but that if he farms it in the way a great many do, a few years will see the end of his farming. I have noticed an extraordinary thing amongst the German settlers. They raise great quantities of rye there. They will take a crop of rye off a field, and leave it for a couple of years to grow up in weeds. To look at the land you would imagine that nothing would grow on it again, but in a couple of years they turn the soil over again and have another splendid crop of rye.

By Mr. Kirk:

Q. Do they apply fertilizers?—They have very few to apply; they do not farm in that way.

Q. Do they not raise stock?—Some of them do. They are paying more attention to their farms now than formerly. In fact one of the advantages the farmer possesses by the railway passing through the county and taking in the supplies to the timber limits is, that having lost the revenue from teaming, they are paying attention to their farms. Teaming is a greater disadvantage to the farmer than it is an advantage.

By Mr. Sproule:

Q. What class of farming is best there?—Mixed farming.

By Mr. Kirk:

Q. Does that include stock-raising?—They always have two, or three, or half a dozen cattle to sell and that brings them in money in the autumn.

Q. Then they would have manure as a fertilizer?—They do not appear to utilize it very much. They do a little, but not to a great extent considering the quantity of ground they go over.

By the Chairman:

Q. You are speaking now regarding the free grant territory only?—Yes; of course I am not speaking of the county generally. There are a great many good farmers in the older sections.

By Mr. Cochrane:

Q. Do they keep sheep at all?—Yes; a good many sheep on the Opeongo Road, and very good ones too.

By the Chairman:

Q. They can be raised profitably there?—Yes; it would seem so.

By Mr. Cochrane:

Q. On this light land do they ever grow clover?—No; they sometimes grow buckwheat and turn it in for fertilizing purposes.

By the Chairman:

Q. You mean they do not grow clover as a fertilizer?—Yes.

Q. Do you know anything about the fruits best adapted to that section of country?—I cannot say it is a fruit district; but I can say that apples, mostly of the Russian varieties, can be grown there with a little care. Grapes can be grown very successfully in the open air. I have had a great deal of experience in that line myself, and have grown as fine out-door grapes as I have ever seen. Raspberries, blackberries, strawberries and currants can be grown in great profusion and to great perfection. Of course you have to protect the grapes and the strawberry from the frost during the winter. This you do by covering them with a little litter.

Q. What descriptions of grapes are best suited to the district?—I have grown the Concord. Those that I find best are Rogers, Hybrids and the Agawam. I have also grown No. 9, No. 5, and No. 15, and a white grape, the name of which I do not know, but it resembles the Isabella very much in shape. The Delaware grows very well in the county; it ripens early and stands the climate well.

Q. Have these grapes you speak of been raised in the open air?—Yes; without any protection from glass; they ripen early in the open air.

By Mr. Sproule :

Q. You have to take down the vines in winter ?—Yes ; I trim the vines down in the fall, and just throw a little litter over them.

By the Chairman :

Q. Barnyard litter ?—Yes · but the coarser the better. We lay that over the vines in the fall, and there is no trouble with them at all. I have done this, and have never lost a grape.

By Mr. Sproule ;

Q. What class of soil would that be on ?—I grow the grapes right on the bank of the Ottawa, in a strong, gravelly loam.

Q. Would not they do better on a clay bottom ?—I think they would. I find that there is no fertilizer that produces such grapes as soapsuds. That is a fertilizer I use, and have used for many years.

By Mr. Hickey ;

Q. Have you tried straw as a litter ?—No ; I have not tried it. I have tried pine branches though. The plants want something to keep the snow off, and at the same time not heavy enough to pack them down too tightly. I have covered strawberries that way. It is necessary to cover them at the start, and when I have covered them I have done so with the branches turned down, to keep them from being smothered.

By the Chairman ;

Q. Do small fruits, such as raspberries, currants, strawberries, and so on, grow in great profusion ?—Yes ; all that sort of fruit does.

Q. Is it possible to grow all those smaller fruits with profit and advantage ?—There is no doubt of it.

Q. As regards apples : do you think a very hardy variety can be grown with profit ?—I am certain that such a variety can be grown. Hitherto no particular attention has been paid to that branch of fruit culture, but some attention is being paid to it now, and some farmers, I know, have very good orchards beginning to come on.

By Mr. Sproule :

How do you find plums ?—Plums will not grow at all ; that is, no plum but our ordinary wild plum, which may be improved wonderfully by cultivation. The wild plums grow in great profusion.

Q In our county it was thought that plums would not grow at all ; but they have tried them, and have found them to be a splendid crop ?—I have no doubt.

By Mr. Armstrong :

Q. In using soapsuds for fertilizing grapes, how do you apply them ?—I simply throw the suds around the roots. I make the servants, every washing day during the summer, dispose of their soapsuds in that way.

By the Chairman ;

Q. What markets have the settlers in that locality ?—The principal market the settler has is among the lumbermen. Before the railway was built, if the lumber trade was in a depressed condition, the farmer was sometimes in a very bad fix, but now a large quantity of the coarse grains, grown in our county, are shipped east.

Q. What classes of grain ?—Peas, oats and rye ; less of oats than of peas and rye. These latter are shipped in great quantities to Montreal, and thence to Europe.

By Mr. Cochrane :

Q. Do peas do well there ?—Remarkably well ; and we have not yet had the pea weevil or pea bug.

By Mr. Hesson :

Q. Do you grow spring wheat ?—Yes ; good spring wheat, but we do not ship any of that. We can use all we grow, and import some besides.

By the Chairman :

Q. You use it in the lumber districts ?—Yes.

By Mr. Sproule :

Q. Do you grow fall wheat at all ?—Yes ; it has been grown very successfully ; but for a number of years the farmers have dropped growing it for some reason or

other. Perhaps it did not succeed for a year or two. At all events, two or three years ago there was a splendid crop all through the country, and they have grown it more largely since. Of course, fall wheat is well protected by snow in our locality. There is no trouble about it in that regard; but the difficulty is that the frost remains too long in the ground, and it appears to break the roots and destroy the plant.

By Mr. Armstrong:

Q. Have you ever noticed what classes of soil are best adapted to wheat growing there?—I think the limestone is. You know our summers are pretty hot there.

Q. Do you not find that it grows more to straw in limestone soil?—No, no.

Q. It seemed to me that that was the great drawback with spring wheat?—Well, nearly all of our soil contains more or less of lime. Even on the top, where the rocks creep out, you will find an immense quantity of limestone pebbles scattered through the soil; so that there is not a good opportunity of judging between the two.

Q. Can you raise beans as well as peas there?—Yes; beans are a very good crop. The farmer has his market for them at home, and gets a good price for them from the lumbermen. He gets from $1.50 to $2 and $2.50 a barrel for them.

By the Chairman:

Q. Is there a good demand for beef and butter from the lumber districts?—Yes; all the beef that can be raised and all the butter that can be made in the county can be sold to the lumbermen. They use large quantities of both beef and butter now in the shanties. The farmer sells his herd on foot; he can pack his butter all summer, and one advantage about it is that he need not be very particular about the quality.

Q. He does not need to supply the very best quality?—No.

By Mr. Trow:

Q. What price does he get for his butter?—It ranges from 15 up to 20 and sometimes 22 and 23 cents. About 16 or 18 cents was the average price last fall.

Q. Do they raise large quantities of oats?—Yes; great quantities.

Q. What price do they get for them?—The price ranges from 35 up to 40 and 45 cents.

By Mr. Armstrong:

Q. Are the oats of the best quality?—Yes, of the best quality; they raise them in large quantities too. It is quite a common thing for a farmer who has a good farm to have 100 bushels to the acre. I have known it in many instances.

By Mr. Farrow:

Q. What quantity of beans per acre do they raise?—I cannot tell you that.

Q. According to the price, beans would be a paying crop?—Yes; but they do not grow them in large quantities; they are a hoed crop and require a great deal of labour.

By the Chairman:

Q. They grow about 25 to 30 bushels to the acre on light, gravelly soil, do they not?—Yes.

By Mr. Hesson:

Q. Do you get 100 bushels of oats to the acre on old farms?—Farms that have been cultivated for years.

Q. On land that has been heavily timbered?—From land that has been heavily timbered, and from pine land too. There are fine lands in the Townships of Bromley, Westmeath and Ross, and in our own vicinity. I have no hesitation in saying that there are large portions of those townships which contain as good land, if not better land, than in Western Canada. There are lands there which were originally too wet for settlement. These are being taken up, and as they are dried off they realize one's idea of prairie soil.

Q. Are there a number of improved farms for sale?—There are a number of improved farms that can be purchased. I have always held the opinion that if a farmer came into the country with a moderate amount of capital, $4,000 or $5,000, he can buy a farm at once; many of our farmers are ready to sell if they get their price, for they can go west or farther into the woods, and commence again. The average price of ordinary land in the country is $15 and $20 an acre all round, including cleared and uncleared land and the buildings.

By Mr. Kirk:

Q. What would the buildings be worth?—The buildings generally consist of a very fair sized log house, in some cases clap-boarded. On large farms there will be a couple of frame barns, say 40 x 40, and perhaps the original log barns, in a good state of repair. Then there will be stables, a milk-house, and other buildings. The buildings, generally, are well and neatly built.

Q. What price does lumber bring?—The common lumber is worth $12 a thousand.

By Mr. Armstrong:

Q. How is the country for potatoes and other root crops?—Potatoes grow admirably and form a very large portion of the farmers' crop. At present there is a large demand for them. They are sold in great quantities to the shanties, because now the railway can carry them in there without their freezing. A brother of mine grows turnips and mangolds, I think for amusement rather than for profit. However, he raises stock and uses them for feed. I think he averages on a ten acre field—I am almost afraid to say it—one thousand bushels of mangolds and turnips to the acre. They are a fine crop, not too bulky, but still large and heavy. He generally grows about ten acres of roots altogether.

By. Mr. Hickey:

Q. You consider these large crops?—Yes.

By Mr. Trow;

Q. Could you not afford to take a few bushels off that large estimated crop of oats?—No; but remember I am not giving that as an average crop.

By Mr. Kirk:

Q. What would be an average crop?—The average crop would be between forty and fifty bushels to the acre all round. I have been surprised, not in one, but in many instances, at the quantity of oats grown to the acre.

By Mr. Sproule:

Q. In raising cattle and sheep the only expense the farmer is at is that of feeding during the winter. As I understand it, you have splendid grazing lands outside of the arable lands of the farms, where cattle can be fed up to the fall?—Yes; and another thing, the farmer who goes into the free grant territory if he has sheep enough, can get hold of a piece of a beaver meadow and with a little work he can cut enough hay off it to keep his cattle all winter. They generally let the cattle run in an open shed and eat from a straw stack or a beaver hay stack during the winter. But a great many do house their cattle and feed them; and it pays them.

By Mr. Cochrane:

Q. If they can raise good potatoes, they can raise good turnips?—Yes.

By Mr. Armstrong:

Q Stock-raising will pay there?—I think so. I am surprised that any man with capital going in and taking up a large tract of country, where there is plenty of water and plenty of grass, and good soil, out of which he can grow roots, can not make a paying speculation out of stock-raising.

By Mr. Hesson:

Q. You spoke of the great success in grape growing there: do you export any grapes?—I think I was one of the first grape growers in the county, and I undertook to grow grapes with the idea that I would achieve success. I found after a while that there was no trouble or task in the thing at all. Then I have been for years advertising grape growing among the farmers; and now numbers of them have grape vines on their grounds or somewhere around their houses. They rather take an interest in it; so that the business of grape raising is growing considerably. Of course, they do not grow for exportation at present, and I do not honestly think they can, unless more labour is spent upon the cultivation of the grape.

By Mr. Armstrong:

Q. Did you ever notice in land that has been used for pasturing purposes a tendency to grow up in weeds again?—It is a very common thing; especially if there are a few stumps left in it, it will grow up in underbrush.

Q. The first year it will grow up in choke-cherry or something of that sort?—Choke-cherry or the common red cherry, or something of that sort.

Q. Have you any fishing there?—Yes; that is the great attraction to the English farmer; he will have plenty of sport, both fishing and hunting.

By Mr. Sproule:

Q. In growing grapes, do you usually plant the vines at the side of a building or out in the open air?—I have tried both ways. I have found that with those planted on the side of a building, that is four, five or six feet from the building, the reflection of the sun brings them on a few days earlier than otherwise. I have never lost a crop of grapes.

By Mr. Hesson:

Q. Not last season?—They came to perfection even last year.

By Mr. Hickey:

Q. Then how are you off for early frosts?—We very seldom have early frosts. The county is comparatively free from them. I live on the banks of the Ottawa River; an early frost may freeze the water in the river, but the crops are not touched. If you get back into the country, and get into a flat low place near a beaver creek or swale, or something of that kind, an early frost may catch you in August, but if the farmer pulls through August he is all right.

By Mr. Hesson:

Q. Have you had any accessions to your foreign population lately, such as Germans and Swedes?—The Germans who went in there twelve years ago have progressed, and got on so well that they have sent for their friends. I am told by a German who is a sort of factotum among them, that there is quite a large number of Germans coming out this spring. The Germans make first-class immigration agents; they write home for their friends and persuade them to come out.

By Mr. Watson:

Q. Did you have frost on the 7th of September last year; it was a frost common to all Canada?—It did not affect us at all. Our climate is not very severe; I have not worn a mitt or a glove for thirteen years; and I drove last winter every day for an hour or an hour and a-half without a glove.

By Mr. Sproule:

Q. Do not you think that the soil being largely of a sandy nature, absorbs more heat in the summer, and forces vegetation on more rapidly than heavy clay soil? Does not it cause the crops to ripen earlier?—There is no question about that; your sandy soil forces your crops on, and brings them to perfection more rapidly; but the crop is not so good a crop as you can grow on clay soil. The clay holds the moisture longer than does the light land, and the evaporation keeps the land cool and does not force growth.

By Mr. Hesson:

Q. Within your knowledge, would there be much room for homsteaders; would they find places for settlement?—I think they would. I am of that opinion, although not to a very great extent. As I told you, there is not more than 50 per cent. of the country fit for settlement. Of course people would not be able to homestead as freely as I suppose they would in the North-West; but certainly there is no trouble for a man who is industrious and has any brains at all, in getting along there, and doing as well as in any other part of the country.

Q. Are three or five years' residence required?—Five years' residence.

Q. And are the valuable timbers nearly all gone?—Nearly all gone.

Q. Is the timber all under license?—All that is not cut away, or burned, is under license.

By Mr. Armstrong:

Q. Do they grow barley there?—They do not pay any attention to barley. A few farmers may grow it as an experiment, but for export they do not grow it at all.

By Mr. Hesson:

Q. What is the nearest market?—Pembroke is the principal market for what is bought for the lumbermen. Cobden is the principal market for what is bought for

exportation. At Cobden there is an elevator—not a very large one, certainly, but one which does a good deal of work during the season, for there is a large amount of coarse grain grown in the county.

By Mr. Coughlin:

Q. Are the free grant lands far from a railway station?—The Canadian Pacific Railway runs through a great portion of them, and the Kingston and Pembroke will pass through a part of the free grant district. The Canadian Pacific, however, passes through the northern and north-western portions of our county, and right through the free grant lands.

By Mr. Cochrane:

Q. What quantity of land do settlers get free?—Each head of a family gets 100 acres, and each child over eighteen is entitled to a hundred acres.

Q. There seems to be some misunderstanding as to the price of a farm there; is it worth from $20 to $30 an acre, with buildings and improvements?—Fifteen or twenty dollars, I said.

Q. Suppose you were to buy 200 acres at $20 an acre, with improvements and buildings, what proportion of it would be tillable?—You are speaking now, I suppose, of the older sections of the county.

Q. Yes; I understood you to say that any man could go in and buy an improved farm at $20 an acre?—When I say that, I am speaking of the average price of land. Now, on a farm of 200 acres, that would be sold for $4,000, you would find nearly every acre of it tillable.

By the Chairman:

Q. But not all cleared?—Not all cleared.

By Mr. Farrow:

Q. You have farms worth double that in that county, have you not?—We have farms worth treble that. I have eighty acres of land I would not sell for five times that.

By Mr. Cochrane:

Q. Is stumping carried on there to any great extent?—Yes. The screw is used for raising large stumps; of course, in pulling the ordinary stumps they do not use the screw.

By Mr. Armstrong:

Q. Does the homesteader get more than 100 acres from the Government?—Just 100 acres.

Q. Good, bad, or indifferent?—Good, bad, or indifferent; the settler takes his chances.

By Mr. Hickey:

Q. Each of his children over eighteen years of age can get 100 acres?—Yes.

Q. And they can buy any more?—Yes, at 50 cents an acre; but under some circumstances they can get it at 25 cents an acre.

By Mr. Farrow:

Q. I have heard that settlers are leaving the Muskoka district; are they leaving your district?—I can tell you how people come to leave the country. Here is an illustration. In the Opeongo district, a good many years ago, a number of Englishmen of good family and small means settled. They were told that the country was a magnificent one, and every means was taken to get them there; in fact, there was a pamphlet written about the district by a gentleman now in the Civil Service. This pamphlet told how that the streams were full of trout, which leaped out of the waters in order to provide the settlers with breakfasts, and how that the woods were full of deer with antlers ten feet high. These men thought the place was a perfect Arcadia. A large number settled in there at once. They spent their money; they eked out a miserable existence for a few years, and finally they left. Neither they nor their families could stand the country. The did not know the country and they were altogether unfitted to go in there. Now I am satisfied that if any settlers are leaving Muskoka they are of the same class. They cannot do well there. But if you take a German, a Swede or a Norwegian and put him on the land they are leaving, you wil

find that not only will he make a living, but that he will soon have a little balance in his favour in the bank. Much of the land left by the settlers I speak of, in Opeongo, has since been taken up by Germans, and they are quite comfortable upon it now.

By Mr. Cochrane:

Q. Is there plenty of fish in the lakes?—Most of them are full of fish. For trout fishing I always go to the north shore, up amongst the mountains. I have fished there for four years in the same lake and have never caught a speckled trout under a pound and a-quarter in weight.

The Committee adjourned.

Mr. J. C. LANGELIER'S EVIDENCE.

JAMES BAY DISTRICT—CHARACTER AND RESOURCES—SUITABILITY FOR SETTLEMENT—GASPÉ—DESCRIPTION OF PERSONAL EXPLORATIONS—SOIL AND CLIMATE SUITABLE FOR SETTLEMENT—OTHER RESOURCES.

Ottawa, 1st April, 1884.

The Committee met, Mr. White (Renfrew) in the Chair

Mr. J. C. Langelier, called and examined.

By the Chairman:

Q. What is your name and profession?—My name is J. C. Langelier; I am an advocate, of the city of Quebec.

Q. You have taken some interest in the Gaspé and James' Bay district, and have written some pamphlets upon that country, I believe?—Yes; I have been studying the nature and resources of those districts for about ten years.

Q. What is the general character of the country described by you in the title "Southern Watershed of Hudson Bay"?—It is a very large extent of country bordering on the southern shore of Hudson Bay.

By Mr. Trow:

Q. Were you employed by the Quebec Government in making your examinations?—No; I visited the Gaspé district on my own account. I have been travelling through there for four or five years, going up the streams for fish and making an examination of the country.

Q. Were your explorations merely for pleasure?—For pleasure and for information. I know from personal observation that the land in the Gaspé district is of good quality. The district north of Lake Superior, to which I refer, includes the country north of the Height of Land, which is drained by the rivers flowing into James Bay. It extends also south of James Bay, and westerly to the Churchill river and Lake Athabasca. On the east side of Hudson Bay the coast is rough for a few miles inland, but in the interior the country is not supposed to be capable of settlement and good for farming purposes. There have been some crops raised near the mouth of Rupert River, and the Hudson Bay Company have for the last hundred years had a farm in connection with their post, keeping sometimes as many as 250 head of cattle there.

By the Chairman:

Q. Where is that Hudson Bay farm?—At the entrance to Rupert River. The cattle are fed chiefly on fodder procured near the shore of the bay. Besides this, barley, oats, potatoes, and other crops are grown. On the banks of the rivers there are extensive forests stretching far inland, and it has been ascertained from persons who have travelled through considerable portions of those forests, and especially from the Indians, that in all this region there is spruce timber of just as fine a quality as can be found in any part of the Ottawa valley, the logs measuring from 20 to 24 inches across. The country to the south of James Bay is mostly of a flat, level nature, a good deal like the valley of the Richelieu. The soil is of a clayey texture, and in some places it is formed from silt washed up by the action of water.

At the Height of Land there is a sort of ridge or crown, which divides the waters. In some parts of the country in the vicinity of the Height of Land there are rocks, especially around the shores of Lake Abittibi, but the soil is of a good clay or sandy loam. On all sides of this lake there are very fine forests of pine—red and white pine—and other trees, and forests of spruce extend as far west as the Churchill river. There is a good country awaiting development to a point very far south, on the east side of James Bay.

Q. What parallel of latitude is the country in to which you refer?—It extends as far north as 65°.

By Mr. Trow:

Q. You are pointing out the work of a life time in travelling and exploration. I would like if you would start at some particular point in your travels, and make your statement continuous?—In my opinion the district fit for settlement and cultivation is comprised in that tract of country lying south from the River Abittibi to the Height of Land, and west to the Albany River. This includes about 60,000,000 acres of good farming land. The soil is a sandy loam. As to the climate, it has been ascertained that wheat will grow at Moose Fort, and even tomatoes have been grown in the vicinity of the water. On the Abittibi River and on the Albany River, at Martin's Falls, the Hudson Bay people have been raising wheat and other cereals successfully.

Q. Not in large fields, I think, but in small patches and in sheltered places?—It has not been grown in large fields. Coal has been found on the branches of the Moose River. It is a lignite coal. Gypsum also has been found in considerable quantities. There is also iron in such large quantities that miners have declared that it would pay to work it. A great objection heretofore has been urged against that country, that it is subject to frosts; but this comes from dampness of the soil, which would be removed by cultivation.

Q How far is the Moose River navigable from its mouth?—For about thirty miles, with a little work in removing a few obstructions. In high water, the Moose and its branches can be navigated for a distance of sixty miles. The Albany River is navigable for a distance of 250 miles, and the current is so steady that the boatmen cut a fir tree and use it as a rudder on their large boats. Further navigation is interrupted by falls of some 40 or 50 feet in height, but beyond these falls there is a further stretch of navigation of thirty or forty miles, deep enough for steamers drawing from 12 to 15 feet of water.

By Mr. Hesson:

Q. Are you giving the results of your own experience and observation in travelling?—No, Sir; I am giving the experience of other persons who have travelled through the district, and especially the information obtained from Indians who are familiar with the country.

By Mr. Bain:

Q. What points have you visited personally?—I have been up the Ottawa, and to the head of Lake Abittibi.

Q. You have never visited James Bay personally?—No; but I have been studying and examining all the papers and reports that I could obtain on the district for the past ten years. The iron ore in that district is known to be one of the best ores to be found, and it is similar to that used in the manufacture of Bessemer steel. The same kind of ore is found in Germany and England, and the United States imports thousands of tons of it every year for manufacturing Bessemer steel. This ore contains about 25 per cent. of manganese, which gives a purer metal when the ore is worked and much reduces the cost of manufacture. Manganese contains much hydrogen, and in smelting, the gas gives more heat and consequently turns out a purer iron than in the case of other ore. In Germany that kind of ore exists in large quantities, and it has been smelted by the use of common wood, or of lignite.

Q. I suppose there is no timber in the vicinity of those iron deposits, so far north as they are?—No; there is only small timber. It is too far north.

By Mr. Trow :

Q. Those mines have never been developed, I suppose?—No; only in the case of lead, which has been found there. In 1859 the Hudson Bay Company took a ship load of lead ore to the old country, and it gave 85 per cent. of pure lead.

By the Chairman :

Q. Is there any coal in that vicinity?—Not in the vicinity of the lead deposits. Traces of coal have been found there, but not in sufficient quantities to vouch for the existence of large deposits.

By Mr. Bain :

Q. Is iron found far north on the east side of James Bay?—Yes; it extends as far north as any observations have been made in all the islands of Notaskopa Sound. The country is all of the same formation.

By Mr. Trow :

Q. But the waters there are only navigable for a few months in the year?—I have no information about that. I think the best means of communication would be by James Bay and the Moose River, and also by Lake Nipissing. Of course it would be necessary to bring the iron ore down to the lignite coal, and this description of iron ore is especially suited to the use of lignite for smelting purposes. An objection is usually found in the use of lignite for smelting purposes, that it contains too much sulphur. Now, manganese is the very thing that is used to neutralize the sulphur. I think the finest iron deposits that are to be found in North America exist in this region. And in the waste of this smelting from this kind of ore, there is found about 25 per cent. of manganese, which is valuable for bleaching purposes, from 40,000 to 50,000 tons of this material being annually imported in England alone. The manganese remains in the waste, and its value is not impaired by the smelting process.

By Mr Bain :

Q. Do you know anything of the islands that are further down in James' Bay?—Yes. They are not of any economic value.

By the Chairman :

Q. Do you think that farming can be carried on profitably in any portion of the region you have described?—Certainly. I am sure that in all this region around the Abittibi, Moose and Albany Rivers, farming can be carried on as well as in most parts of the Province of Quebec, so far as soil and climate are concerned.

By Mr. Bain :

Q. What varieties of timber grow on the flat lands south of James' Bay?—Principally spruce.

By Mr. Trow :

Q. Is not the land there spongy?—No.

Q. I have been told that north of the Height of Land it is mossy and wet?—No; I have never seen it so, and there should not be any moss there, because the soil, for the most part, is not swampy.

By Mr. Hesson ;

Q. Do I understand you to say that the timber exists only in the vicinity of the rivers?—It recedes from the rivers for considerable distances. In the immediate vicinity of the rivers there is a stretch of low ground, then there is generally a ridge forming a sort of levee, and behind that there is a tract of lower ground. This is all timbered.

By Mr. McCraney ;

Q. You say the timber is the best on the higher land?—Yes.

Q. What is the quality of the timber?—It is spruce. In the lower parts there is tamarack, and in the higher land there is white spruce and pine.

Q. Is it large?—Yes.

Q. How large is the pine?—From 18 to 24 and 30 inches across. The pine is the variety which is least frequent. White spruce is more abundant, and you will find it everywhere from 20 to 24 inches in size.

By the Chairman ;

Q. Is that spruce equal in quality to the spruce which grows along the lower St. Lawrence and on the Saguenay?—Yes; it is far better in quality. I know

this from parties who have been sent out there in the interest of lumbering firms, to examine the country, and they report that the spruce there is quite larger and longer than ours.

By Mr. McCraney:

Q. What percentage of land would be suitable for cultivation in the district you have pointed out?—I think the same percentage as in the eastern part of Canada—50 per cent.

By the Chairman:

Q. Are there many fish in that region, and what are the principal kinds that are found in the rivers and the waters of Hudson Bay?—In the rivers you will find salmon in all the region east of Hudson Bay. They are a little whiter, perhaps, than our salmon, but they are very fine, and they are found in immense quantities. Of course it is well known that the Indians live, for the most part, on the salmon. In the bay there are seals of a very large size, and walrus, and other kinds producing oil.

Q. Are the fish very plentiful in those streams?—Yes; very plentiful.

Q. What kinds of fish are there in Hudson Bay itself?—They are not edible fish; they are principally seals and other kinds that are caught for their oil and skin.

Q. How would that country be put in communication with other parts of the Dominion?—If there is a railway built from Winnipeg communication will thus be established, but I think the real means of commuication would be with Ontario, by a continuation of the Northern Railway, and with Quebec by the Quebec and Lake St. John Railway. A Local charter and a Federal charter as well, have been granted for the construction of a line from Lake St. John as far as James Bay.

By Mr. Cochrane:

Q. What is the territory like from Lake St. John westward, and to the boundary, as you have been pointing it out?—The part westward from Lake St. John is a good district, and it can be settled and made valuable for farming purposes, but if you go further north the country is not suitable for settlement.

Q. You mean that westward from Lake St. John to James Bay there is a good country?—Yes; farming can be carried on there successfully. Even in the vicinity of James Bay barley can be grown without difficulty. Near Lake Abatagoman large deposits of sulphuret of copper have been found, covering many square miles. The Height of Land rises in some places to 1,350 feet above the sea.

By Mr. Bain:

Q. Is it not rather rocky around the Height of Land, as a rule?—Yes; but in the vicinity of the bay it is flat and of a clayey nature. The tide in James Bay rises about 15 or 16 feet, and covers the flats around the border of the bay for a long distance. The reports of the Geological Survey state that at the mouth of the Moose River the water is so shallow that you can touch the bottom with an oar at several miles from the land.

By Mr. Trow:

Q. So there is not a very good harbour there?—No; the harbour is not very good. The channel shifts very much.

By the Chairman:

Q. Have you visited the Gaspé Peninsula?—Yes; I have been all around that district.

By Mr. Trow:

Q. What is the nature of the country around Metapedia?—The country is very good, but the timber has been burned away for years in several places. Still, in the central part of the Metapedia Valley there is a considerable quantity of good timber left, especially in the lower part.

By the Chairman:

Q. What is the general character of the soil in the Gaspé Peninsula?—The soil is a rich, yellow loam, as a general thing quite free from stone and all other obstructions to cultivation. Even on the top of the mountains there are fine tracts of good soil, capable of cultivation, and a good deal of it is under tillage.

By Mr. Bain:

Q. The mountains are not rocky?—No; from the summit of the mountains there are large tracts of level country where the soil is of good quality and free from stones or boulders.

By Mr. Trow:

Q. Is it not very rocky about fifty or thirty miles on the other side of the Metapedia, on the east?—As a rule it is not stony. There are some stones, but nothing to interfere seriously with cultivation.

By the Chairman:

Q. What kind of timber grows in that district?—Nearly all kinds. The finest timber is in the vicinity of the Bay of Chaleurs, where for about thirty miles there are splendid forests of maple, cedar, birch, ash, elm and other trees. In some parts of the district there are pine trees of immense dimensions, and I saw birch trees myself that would make a log 20 inches square, 45 feet from the ground.

Q. Free from black heart?—Free from blemish of any kind, and first class in every way.

By Mr. Campbell (Renfrew):

Q. Is there any spruce there?—Yes; in some places there is very fine white spruce. There is the finest spruce to be found there in the whole Province of Quebec.

By Mr. Trow:

Q. Are there many settlers in that district?—By the Census of 1884, 43,000 and upwards.

Q. What are the terms on which land can be procured from the Quebec Government?—The price varies from 20 to 60 cents per acre, with settlement conditions to perform.

By the Chairman:

What is the general character of the climate in that district?—There are two distinct divisions of climate there. On the north shore the country is more exposed and has a northerly slope, and the wind from the ice in the spring makes the seasons somewhat cold and backward. But on the south shore the climate is very fine. There are no cold winds, because the mountains protect the country from the north, and the climate is milder than what prevails in the Province of New Brunswick, on account of its declivity from the range of mountains towards the south.

Q. If the climate is so favourable as you have described, and if the soil is so good, and there are such facilities given by the Quebec Government for settlement, how do you account for the sparseness of settlement in that district?—Because, hitherto, that country has been ignored, and very little information has been circulated abroad as to its character and resources.

Q. Is it easy of access by the sea?—Yes; by making a trip of 400 or 500 miles from Quebec.

By Mr. Trow:

Q. What is the distance from where the Intercolonial Railway crosses that country to the point of the peninsula?—About 180 miles.

Q. And there is no nearer communication for that district than by the Intercolonial Railway?—In the summer time steamers make two trips a week to points along the coast of Baie des Chaleurs, from Campbelltown to Gaspé Basin.

Q. Is there any settlement along the coast?—Yes; it is all settled.

Q Has there been any expenditure on colonization roads through that district?—I have not much information on that subject, but there are no extensive colonization roads there.

Q. Is lumbering carried on to any very great extent?—No; that region has been greatly neglected in that respect. In some districts there are a few lumbering companies, as on the Metapedia and some other rivers, but a great part of the timber along the line of railway has been destroyed by fire.

By Mr. Hesson:

Q. Does settlement extend far inland?—No; there is more or less settlement along the coast, but the central part has not yet been surveyed.

By the Chairman:

Q. There appears from the map to be only a line of townships settled around the border of the peninsula?—That is all; a strip of settlement extends along the coast about the depth of the township all around. In some cases, I think, there are roads extending into the interior to a greater distance than that.

Q. How do those fires occur? Was it from the railway?—No; there were fires there before the railway went in. They were started by the Indians and hunters going through the forests.

Q. Is the timber around the whole of the peninsula practically destroyed by fire?—No; only in the western region. But all around the shore the timber is pretty good yet.

Q. Are there any large lumbering establishments there?—No; lumbering operations have been neglected. The rivers there are especially suited for lumbering, because they have no falls or rapids, and timber can be floated down without any risk. All that is required is to throw the timber into the water and the currents will carry it down safely.

By Mr. Hesson;

Q. Is the timber not all cleared away from favourable positions along the banks?—No; timber operations have been very limited there throughout nearly the whole region. There is a great deal of good merchantable timber, spruce and pine, to be found there.

By Mr. Campbell (Renfrew):

Q. Is there white pine there?—Yes.

By Mr. McCraney;

Q. Have there not been permits issued to cut white pine in that country?—Yes; in some cases.

By Mr. Guilbault:

Q. You have written a pamphlet describing the resources and capabilities of the Gaspé district, I believe?—Yes; I have been collecting information on this district and the James' Bay region, for the last ten years. I have also written a pamphlet on the James' Bay country, which is not yet published, but all the authorities I have quoted from will be found there.

By the Chairman:

Q. Your other pamphlet is not in type yet?—No.

Q. Speaking of the Gaspé district, what are the inducements offered to settlers and immigrants there?—There is, first, a soil of excellent good quality and easy to work. Then there are the fisheries, which afford valuable manure in immense quantities, as well as the means of living for very poor people. A man will, in a few weeks, catch more fish than he can consume in a whole year. And then the settler can combine farming with fishing very profitably. There is an instance given of this in the report of Mr. Richardson to the Geological Survey of Canada, for the year 1857, page 70, in which he tells how a Scotch immigrant who settled on the south shore of the River St. Lawrence, succeeded in this way. He says: "Although the country along the south shore looks somewhat mountainous, and the breadth of flat land capable of cultivation appears to be but small, there are not wanting instances of considerable success in the combined operations of farming and fishing." As one instance, I may mention Mr. Isaac Green, who settled in May, 1856, at the mouth of the River Martin, some distance below Cape St. Ann. In that year he made from 400 trees 300 pounds of maple sugar, and cleared land for the following quantities of grain sown:—

3½ bushels barley sown 16th June, returned 70 bushels; cut 8th September.

16 bushels potatoes planted, returned 300 bushels.

1 gallon onions sown, return one bag.

In addition to this, his two sons, lads of fourteen and sixteen years of age, caught codfish between July and the autumn to the value of £45. In the year 1857 he sowed and planted—

8½ bushels barley, returning 150 bushels.

1 bushel oats, returning 20 bushels.
1 bushel wheat, returning 20 bushels.
1 bushel peas, returning 15 bushels.
20½ bushels of potatoes, returning 300 bushels.
2 gallons onions, returning 6 bushels.

His sons, from the 15th of June to the 1st of August, caught and cured 45 cwt. of cod, and other fish to the value of £15.

Q. I know, as a matter of fact, that several families left Anticosti last year and came up into this district. Some of them settled in my own county, and some in the adjoining counties. How do you account for the fact that they left that magnificent district, and all the advantages you describe, and sought a home at such a great distance?—Because they did not know of those advantages, and because the officers of the Marine and Fisheries Department took them right up to Quebec, whence they left for the west.

Q. Has the Province of Quebec taken any means to bring that portion of its territory into prominence?—No, Sir; not as yet.

By Mr. Riopel:

Q. Has the Quebec Government given any grant or subsidy for the encouragement of railways?—Yes

By Mr. Cochrane:

Q Is the settler who goes into that district and takes up Government land entitled to the timber?—No; the timber is sold to lumbermen and the land is sold to the settler. He can take the timber from the land which he clears, but he cannot interfere with the timber in the woods.

By Mr. Trow:

Q. The settler has a right to clear the timber, but he has no right to dispose of it, I suppose. He can dispose of the timber which he cuts down, but he has no right to dispose of the standing timber?—No. As an encouragement to settlement, the Local Government have expended from $5,000 to $10,000 per annum in public works, roads, &c., in the district. Besides that, there is a railway from Metapedia to Gaspé, which receives a subsidy of 10,000 acres of land per mile, or 1,800,000 acres in all.

By Mr. Blondeau;

Q. Is there a bridge across the river Metapedia, and does the railway cross the river?—Yes; there is a bridge on the Metapedia, but the projected railway does not cross that river.

Q. Who built it?—The Local Government.

Q. Is it a long bridge?—It is a rather expensive work.

Q. Is it finished now?—Yes; I think it was finished last summer.

By Mr. McCraney:

Q. Have you any summer frosts in that district?—No; last summer the frost of the 12th of September, which was felt in nearly all the other parts of the country was not felt in Baie des Chaleurs.

Q. Does the snow fall deep there?—The snowfall is a good deal less there than in the vicinity of Quebec and Montreal. The climate, also, is much more favourable.

By Mr. Hickey:

Q. I suppose there are still vacant farms to be had in the settled districts, of good quality?—Yes; and such land has every advantage, so far as market is concerned. The district of Gaspé is one of the finest districts in the Province, and wheat averages there 13 bushels per acre.

By Mr. Hesson:

Q. Are there any mines in the vicinity of the Height of Land or the Gaspé ridge?—Yes; there are iron mines, and also mines of fine serpentine. It is well known that the southern portion of the Gaspé Peninsula is the best portion of the Province. The land is better in quality; the fisheries there afford another means of income and support, and the climate is not so warm in summer, nor so cold in winter. There is not such an excessive rainfall here as in some other parts of the Province, and the rolling character of the country affords good natural drainage to

the land. For pasturage the soil is excellent; the supply of water too, is abundant, and of good quality. Besides, the fisheries afford an abundance of good manure at small cost.

By Mr. Trow:

Q. About what month does the spring open there?—In some places, as in New Richmond, for example, the season opens about 15th. April This is an advantage of about a fortnight or three weeks over the rest of the Province of Quebec.

Q. But will not the air be very cold from the ice in the north?—No; it is protected by the mountains which rise to a height of 2,000 feet on the north, and protect the district from the northerly winds. Along the coast, to the south of the district, a breeze comes from the Gulf Stream which raises the temperature of this part of the country, four or five degrees higher than other places in the same latitude that are more exposed.

By Mr. Hesson:

Is there any perceptible increase in the population?—Yes.

Q. On which shore is the timber the most seriously injured by fire?—Especially on the Western section.

By Mr. Hickey:

Q. Does wheat grow well in Gaspé?—Yes; all through the district. In Gaspé the yield is about 13 bushels per acre, and in the other districts it is from 9 to 11 bushels. In regard to population, the increase in the County of Bonaventure since 1851, has been as follows:—

From 1851 to 1861	20·72	per cent.
" 1861 to 1871	16·84	"
" 1871 to 1881	23·63	"

Of course that increase was stimulated during some portion of that time, by the building of the Intercolonial Railway.

Q. Is that a fair rate of increase in comparison with the average increase for the whole Province of Quebec?—In the whole of the Gaspé Peninsula, the rate of increase for those years has been:—

From 1851 to 1861	60	per cent.
" 1861 to 1871	35	"
" 1871 to 1881	36·46	"

Throughout this whole district there have been added to the population in other ways than by natural increase, only about 2,000 people, so that the whole increase may be said to be natural, or the excess of births over deaths.

By Mr. Trow:

Q. Of what nationality are the people principally?—They are French, Irish and Scotch, but the great part of them are French, and about one-third English-speaking people.

Q. Is the country being developed to any great extent by railways?—Yes; there is a railway projected from Metapedia to Gaspé, especially as far as New Carlisle, a distance of 100 miles.

By the Chairman:

Q. Is that line built?—No; it is only projected as yet.

Q. Is it to run along the coast?—Yes; the great trouble in the way of railway construction in the centre of the peninsula is that it is mountainous.

By Mr. Fairbank;

Q. Are there plenty of harbours along the coast?—Yes; the harbour of New Carlisle is open all the year round.

Q. Is it much of a harbour?—Yes; it is a very good harbour.

By Mr. Cochrane:

Q. Taking the peninsula as a whole, both south of the Height of Land and north of it, what proportion of the whole is considered good?—At least 75 per cent. of the whole may be considered good farming land.

Q. What is the greatest distance which any of those rivers can be navigated northward ?—The Bonaventure River is navigable for small boats for about sixty miles.

Q. Are there lots of fish in those rivers ?—Yes; there is very fine salmon in the Metapedia, and trout also. There is salmon in all the rivers there.

By Mr. Trow:

Q. Are they as large in all those rivers as they are in the Restigouche ?—Oh, yes; they run from 20 to 30 pounds. Fishing is so good there that a club of New York gentlemen come there every season and spend some time. The Vanderbilts and Mr. Wiman belong to the club. The Duke of Argyle comes also to fish sometimes. The late Governor General has had, for several years, the privilege of the Grand Cascapediac River to fish.

By Mr. Blondeau:

Q. Has a charter been granted for the building of the railway you speak of?—Yes; and the company has been organized. Surveys are being made and the work of construction will commence next summer.

Q. Have they been subsidized by the Government?—Yes; they receive 10,000 acres of land per mile from the Local Government, and $320,000 from the Federal Government. The land subsidy applies to the whole extent of the proposed line, but the money subsidy from the Federal Government is only for the southern half, of 100 miles in length.

By Mr. Fairbank:

Q. Have you observed the rise of the tide along the coast ?—Yes; it is from 7 to 9 feet.

Q. What is the value of the fish exported from the Gaspé district ?—It is about $750,000.

By Mr. McCraney:

Q. Have you any knowledge of the Abittibi River westward to the Nelson River ?—Yes, Sir.

Q. What is your information about it ? Is it a country that would be fit for settlement ?—Yes; there are many places in which the soil is very good. I think the accounts of that district have not been greatly exaggerated. They are raising potatoes and keeping cows on the Churchill River.

By Mr. Cochrane:

Q. Is there any fruit raised in the Gaspé district ? Apples of any kind ?—Not very extensively. The few apples that have been tried succeeded very well. I think they might cultivate grapes with success.

Q. Do they not make a trial of fruit-raising properly ?—No; the people in that part are largely engaged in fishing, and farming is to some extent neglected. In the parishes, however, where fishing is not so much engaged in, the farmers have good crops and they are wealthy.

By Mr. Fairbank:

Q. Have you observed the rainfall in your district ?—It is not so heavy as in some other parts of the Province, but it is more regular.

Mr. ROBERT ROMAINE'S EVIDENCE,

IN RELATION TO A SYSTEM OF TRAMWAYS FOR COLONIZATION ROADS, AND THE LAYING OUT OF VILLAGES AND TOWNS IN THE NORTH-WEST TERRITORIES.

Mr. Robert Romaine, House of Commons, Ottawa, was next examined.

By the Chairman:

Q. You were before the Committee last year, and you gave them some information in regard to a new scheme or system of colonization for the North-West, by a plan of laying out continuous villages along and at each side of the Canadian Pacific Railway, or any branch lines. Would you please state in what manner this system

of colonization is to be carried out?—The system of colonization could easily be effected by devoting the one mile belt of land at each side of the Canadian Pacific Railway, or any branch or main line of railway for the purpose of establishing villages and market towns, and where circumstances would eventually warrant, the establishment of cities would naturally follow.

Q. The mile belt reserve, as you are aware, has lately been thrown open to settlement?—Yes; I am aware of that; but there is not very much of it taken up yet. However, I submitted this scheme to the Canadian Pacific Railway two years since.

Q. Will you state in what manner you would lay out these villages?—The villages would be surveyed out into lots of say 50 yards front by 200 deep, or about two acres each. This square mile would then give one lot to at least 250 farmers of 160 acres each, or a four acre lot to 125 farmers of 320 acres. The balance would be ample to be appropriated to street allowances, market square, public buildings, &c., and would also accommodate the commercial, mechanical and labouring classes with sufficient building lots for their residences, &c.

Q. You would make your villages, then, to contain about from 250 to 300 inhabitants at the utmost?—Yes; of course a man owning a square mile would get a proportionately larger quantity of land in the village. He would have to have labourers and others working for him, who would require extra accommodation.

By Mr. Trow:

Q. You would group them together as they are found in Germany and in some parts of France, in farm villages?—Yes; it would be more in accordance with Continental European life.

Q. Would you propose to have the barns and other buildings, that are usually placed upon farms, grouped together in these villages?—I would have all buildings necessary for the purpose of housing and keeping cattle in the village, but store buildings could be kept out on the farm. For dairy purposes this grouping system would be excellent, as it would also be for cattle feeding.

Q. The outhouses would be on the respective farms, and the dwellings would be in the village?—The outhouses for feeding purposes would also be in the villages. Each farmer would have two or four acres, according to the size of his farm.

By the Chairman:

Q. If all the farmers are to live in these villages, what means would be given them to reach their farms?—The farmers would reach and travel to and from their farms by means of tramways worked by steam, reaching a distance of from 50 to 70 miles at each side of, and at right angles to, the line of railway. The tramways would be built on the road or concession lines, say 4 miles apart, endeavoring always to have one tramway to each station on the line, which I understand are situated a distance averaging 8 miles apart on the Canadian Pacific Railway.

Q. To whom do you propose these tramways should belong, and by whom should they be worked and controlled?—These tramways should and ought to be owned by the county or town municipality, as any macadamized or plank road would be; the first cost, keeping in repair and expense of running the same would have to be borne by assessment on the land in a similar manner to that of roads, bridges, &c., now are in Ontario As to who should work and control them I am not exactly prepared to answer definitely, as there are several circumstances to be taken into consideration. No doubt a workable scheme could be devised. For instance, if the capital to build these tramways is to be raised by debentures on the credit of the County Councils, the interest with sinking fund might be guaranteed by the several Provincial Governments, and I think in that case Commissioners appointed by the latter should have complete control, and say what assessment should be levied for repairs, working expenses, &c.

By Mr. Trow:

Q. Have you any idea of the probable cost of this system of tramways per township of 6 miles square?—The roads would be laid out 4 miles apart through the county, and I reckon the average cost would be about $2,500 per mile, so that the cost per township can be easily estimated.

By the Chairman:

Q. When you speak of tramways, do you propose a wooden or an iron rail?—An iron rail, and I estimate the cost at $2,500 per mile. Of course much would depend on the state of the iron market, &c.

By Mr. Trow:

Q. Would that include rolling stock?—No; but of course the cars would not be very expensive; they would merely be open cars, and not of very heavy construction.

Q. Would that not have a tendency to do away with horses?—Yes; very much.

By the Chairman:

Q. Do you propose that farmers should pay for the village lots, and are the lots liable to be sold for taxes or other debts?—No; the farmers do not pay for their village lots; they possess the lots on suffrance only, and on the condition that they are the owners or tenants of the farms they are cultivating. When a farmer sells his farm he will also be obliged to sell any improvements on the village lot, or if he even rents his farm, then the tenant who works and cultivates the farm will have the right to live on and possess the village lot. As to liability for taxes and other debts whatever, there should be legislation exempting both the village and all the immovable property from distress by law. At the same time, there should be no compulsion for a farmer to live on a village lot if he preferred to live on his farm or elsewhere.

Q. Do you not think that farmers in general prefer living on their farms, instead of in a village?—No; I think the great majority, especially farmers with young families, would prefer living in the village, because the present system of locating the residence of farmers so far apart on their farms, very often in-out-of-the-way places, removed long distances both from the schoolhouse and place of worship, is a great drawback to education and civilization. By this new system of congregating them in the same town or village, and that town being the established market town, sociability and cordiality among the farmers and their families would be greatly fostered by the close proximity of their residences and the available intercourse so obtained. Besides being, especially in winter, close at hand to the butcher, grocer, dry goods merchant, and in case of sickness being near the doctor, would be a great benefit in every respect.

Q. What other benefits do you think the farmers would derive in case your system was adopted?—Well, I think, that by so congregating together in the manner mentioned, a community of farmers and their families—who otherwise would be scattered over an area of several townships—would by this new system be alongside of, and quite near to, a main line of speedy communication with some large city, so that all the religious, educational, temporal, social and intellectual benefits possessed by that city, could be readily enjoyed and obtained by that village or town, if thought desirable.

By Mr. Trow:

Q. Would there not be considerable risk from fire taking place where the farm buildings would be so close together?—The buildings would always be two acres apart, from centre to centre.

Q. Would you not have buildings for the storage of grain out on the farm?—Yes.

Q. Well, I have reference to those buildings?—Of course there would be some risk.

By Mr. Cochrane:

Q. You would house the cattle in the villages, and of course you would have to draw all the fodder in to them. How do you propose to take your manure out?—You can draw from ten to fifteen tons of manure on a tramway of this kind as easily as you can draw a much less quantity a shorter distance on a waggon. In England they now draw manure ten or fifteen miles on the cars, and this is quite a common custom.

Q. But it would have to be taken off the cars and distributed by teams and waggons, and this would be handling the manure three times?—Yes; but now they are

beginning to use a system of green manuring more than anything else. You can do more with green manure than with stable manure. But of course you would have to make some use of the manure made in the stable, which, of course, is always improved by being turned over two or three times.

By the Chairman:

Q. You said something last year about the benefit the Government would derive by adopting your system of villages and towns?—Yes; for instance, take the regular postal service to villages and towns lying some distance from the line of railway. It is very expensive to forward mails by stages, besides the trouble and inconvenience of making up weekly, semi-weekly, tri-weekly and daily mails. It would also facilitate country labourers and others depositing their earnings in the Post Office Savings Banks. It would assist the movements of the Militia and Constabulary for sudden emergencies; the bringing and summoning Witnesses and Jurors from a distance in attending the Assizes, and the whole administration of justice in general, all along the line. The telegraph and telephone service would be more concentrated and facilitated. All the county and other public buildings being located close to each other in every town on the line, the municipal business of the county, as well as the townships, would be greatly facilitated. In fact wherever the system could be adopted and carried out, incalculable benefits would annually ensue to the whole country at large.

Q. What saving in carting to and from the farm to the railway station do you think would be gained?—I have no hesitation in saying that a saving of ten to one would be gained by the tramway system over the carting done by horses. At present the produce of the country has to be carted from all points of the compass to a large town or city market as a centre, incurring a great deal of useless and extra mileage of cartage. By this new system every station on the line must, and would be, a far larger and more extensive market for wheat and other produce. Take, for instance, six townships in length at each side of the railway, and one and a-half townships in breadth (nine miles), fronting on the line of railway—about the general distance between two stations—making an area of country drained of its produce 324 square miles at each side, or 648 square miles for both sides of the railway, and there is no valid reason why the tramways and this system should not extend for fifty or sixty miles at each side, if the country will admit of it. The railway company would find it easier also to load, as the elevators are placed quite close to the sidings at each side of the station, and in delivering and receiving goods and merchandise, the tramways on the several avenues, and also those on the concession roads, could be made use of by them if they thought fit, and car loads could be taken almost to and from the very doors of the merchant or shop-keeper, as well as machinery to and from the machine shop, the gauge of both tracks being the same.

Q. Do you not think that these tramways would do away with the necessity of building so many branch lines of railway?—I feel certain that they would, to a very large extent. I dare say you will remember, only but a few years since, when Illinois and other Western States began to be settled. The great outcry there was to get railroads to bring the farm produce to market. Now they have plenty of railroads, and if you examine a map of northern Illinois especially, you will find that you can hardly strike a straight line for a distance of twenty miles in any direction without touching a line of railway. Still, that does not mean that a farmer there has not to travel more than twenty miles to reach a station, and it is a demonstrated fact that wheat cannot be grown and carted twenty miles profitably. I feel certain, after reading the complaints of the farmers of our own North-West, that a great deal is attributable to the want of good tramways, not only to within twenty miles of their farms and residences, but to their very farms, or within, at least, to an average mile of them, as this system proposes to do. I therefore repeat that this new system of laying out concession line tramways in connection with permanent markets, would prevent, to a very large extent, the necessity of expending both capital and labour in building competing lines of railway, some of them running almost parallel and close to one another, with all their additional staff of officers, stations, &c. The already existing main lines would then find it to their advantage to lay down additional tracks to do the work.

By Mr. Allison (Lennox):

Q. What would be the motive power for your tramways—horses or steam?—You can use horse-power if you like, but steam-power is what this system proposes to employ. In reference to what I have just said about railway lines intercepting each other in all directions, if you will take a map of the North-West you will see that a line of railway branches off from the main line of the Canadian Pacific Railway and runs at an angle in the direction of the Saskatchewan. Now, those two lines should be parallel, located a suitable distance apart and fed by tramways running to them at right angles. If you had a map of northern Illinois, you would see that you could scarcely draw a straight line twenty miles long without cutting across some line of railway. Instead of that, they should run parallel, about 100 miles apart.

By the Chairman:

Q. In making your estimate of the cost of these tramways, have you taken into consideration the physical difficulties of the country, or do you estimate for a flat, prairie country?—I estimate for a prairie country. There is no necessity for grading, as a rule; nine-tenths of the road could be laid on the grass. Of course there would be little mounds here and there that would have to be levelled down.

By Mr. Cochrane:

Q. In what part of the country do you think nine-tenths of the tramway could be laid on the grass?—I refer to our own North-West Territory, where, from what I can read of the physical features of the country, it is all a rolling prairie. However, like everything else of course, it would not go over mountains, and there is no necessity why the road might not be taken around an occasional obstruction for a few miles.

By the Chairman:

Q. Have you any approximate idea of the first cost per mile of the tramways, and how would they compare in cost and repair with good macadam and plank roads?—The cost of the tramways would depend a good deal upon the locality, and other circumstances—the labour market, &c.—but from what I can gather it would range between $2,500 and $3,000 per mile. A good plank or macadam road could not, I think, be made for much less. It is hardly fair, however, to draw a comparison between the two, because one horse on a good tramway will draw ten tons, while one horse on the best common road will have enough to do with one ton. As to repairs, the circumstances are so varied that I could not at present mention any approximate sum, but it will be readily admitted that it is one of the first duties of a new county or township municipality to provide good concession roads and bridges for easy access to the market town. At the same time these roads are expensive to make, as well as to keep in repair, whether the material is close at hand or not. By adopting, therefore, in new districts about to be settled, the principle or system of locating and laying out towns and township tramways, say four miles apart, there would at least be only one road to build and keep in repair by the municipality instead of four, incurring thereby less annual taxation, besides dispensing with a good deal of horse labour for doing the work of carting.

By Mr. Watson:

Q. What would be the description of this track; would the rails be of iron, and what would the roadbed be made of?—I would use a light iron rail. For the roadbed I would use a longitudinal sleeper, and iron tie-rods to keep the road from spreading.

By Mr. Cochrane:

Q. I believe you advocate a system of steam cultivation for the North-West?—Yes; I do.

Q. And I understand you to say that it would do away with horses?—I am advocating steam cultivation without any horses.

Q. But we know that the horses that will farm your land will draw away all the grain you will produce?—A distance of thirty miles?

Q. Yes.—It will not pay to draw it thirty miles.

Q. Many of us come from sections of country where that is done. There is no use in advocating theory in this matter; in the back part of my Riding it is more

than that distance from the frontier, and farmers have drawn their grain to market for years and have grown wealthy. The wealthiest township in my Riding is the Township of Seymour, and the farmers of that township have had to haul their grain a greater distance than thirty miles?—Yes; but they must have had good roads.

By the Chairman:

Q. Do you consider that the cost of keeping up these roads would be greater or less than the cost of keeping up macadamized roads?—I think it would be less than in the case of a good macadam road.

Q. We are speaking merely of repairs?—Yes; the cost of keeping up. Of course, rolling stock would be expensive.

By Mr. Cochrane:

Q. How long do you suppose an average tie, or sleeper, would last?—I propose to use a longitudinal tie. Mr. Schreiber has told me lately of a new material which is being got out for ties. which will not be so perishable as wood. It is made of paper pulp and straw, and will be almost imperishable.

By the Chairman:

Q. What is your opinion respecting the cultivation of belts of trees in the villages?—In following the plan I have explained and described, the several towns and villages, and the railway company themselves, might, if they thought fit to do so, have broad belts of trees or shrubbery planted and cultivated on each side of the street, say 25 feet wide, at the rear of the lots 200 feet, and at each side of the railway 200 feet, as a protection against snow storms, blizzards, &c, and also for the purposes mentioned and spoken of by several of the speakers at the late meeting of the American Forestry Congress, held at Montreal.

Q. Have you devised or elaborated any plan by which these tramways would come under the control of somebody who would regulate their running and prevent collisions between the parties who would require the use of them?—Yes; I have shown here that the county would borrow money, as we did for instance, at Peterborough and Port Hope, and of course the parties who would guarantee that money would appoint some one to see that the road was properly kept up.

Q. What I want to get at, is this: each of those tramways would be a separate road of itself and would require to be under separate control, as regards the fixing of the time of running of trains?—Each county would have three roads running through it.

Q. Then they would require to have a Superintendent for each of those roads?—Oh, no; they would be only four miles apart.

By Mr. Hickey:

Q. Would you have switches on the tramways?—Yes; the cars would not come in contact with each other going in opposite directions. Opposite each farm there would be a siding, at which a man could place a car and keep it for several days, till he had it loaded with wheat or other produce. In this way he could bring fifteen tons of wheat to market at one load.

By Mr. Trow:

Q. This is an entirely new system, is it not. Has it ever been adopted in any country?—The Mennonites have adopted the village system to some extent, and also in the Province of Quebec, where the holdings are cut up into narrow strips.

By Mr. McCraney:

Q. What would you think of the idea of laying out these lines to run on every township line. In that way the roads would be six miles apart?—I have them laid out on a plan of four miles apart, but, of course, any distance might be fixed upon that would be desirable. With this system the farmer who is situated thirty or forty miles from the trunk line of railway would have to travel on an average only one mile to the tramway, and an immense amount of carting would be saved.

Q. What do you think of the idea of using horses on the tramways instead of steam?—That can be done. I would not put a heavy locomotive on such a road, but a light engine something like a dummy engine, could be used, and light passenger cars could also be placed on the road. One engine would be able to draw from ten to fifteen cars,

each car carrying fifteen tons. As an instance of the saving that would be effected in this way, I may mention that I have a friend who is farming out from Brandon, and he writes me that it has cost him 20 cents a bushel to get his wheat to Brandon. Now, with a tramway you could draw wheat a distance of thirty miles at a cost of less than 5 cents per bushel.

By the Chairman:

Q. But when you bring your grain down to the village at the trunk line of railway, it may be that the railway station is ten miles distant in one direction or the other on the railway. You would then have to unload the grain at the village and draw it that distance to the station?—The railway stations on the Canadian Pacific Railway are located on an average of eight miles apart, and no point on the railway line can be farther from the station than four miles. Besides, I would have a tramway track running parallel with the railway line to the station, and in this way the difficulty you speak of would be avoided.

The Committee adjourned.

REPORT

OF THE

SELECT COMMITTEE

OF THE

HOUSE OF COMMONS

TO ENQUIRE INTO

THE QUESTION OF THE NAVIGATION OF HUDSON'S BAY.

Printed by Order of Parliament.

OTTAWA:
PRINTED BY MACLEAN, ROGER & CO., WELLINGTON STREET
1884.

HOUSE OF COMMONS, Monday, 11th February, 1884.

Resolved,—That a Select Committee composed of:—

Mr. Abbott,	Mr. Brecken,
" Casey,	" Dawson,
" Desjardins,	" Foster,
" Macmaster,	" Paint,
" Riopel,	" Ross,
" Royal,	" Scott,
" Watson,	" White (Cardwell), and
" Woodworth.	

be appointed to take into consideration the question of the navigation of Hudson's Bay; with power to send for persons, papers and records.

Attest:—

JOHN GEO. BOURINOT,
Clerk of the Commons.

WEDNESDAY, 13th February, 1884.

Ordered,—That the quorum of the said Committee be reduced to five members, and that leave be granted them to engage the services of a shorthand reporter.

Attest:—

J. G. BOURINOT,
Clerk of the Commons.

REPORT.

Of the Select Committee of the House of Commons to enquire into the Navigation of Hudson's Bay.

HOUSE OF COMMONS, COMMITTEE ROOM, 8th APRIL, 1884.

The Committee appointed to enquire into the question of the navigation of Hudson's Bay beg to submit the following Report:

Hudson's Bay, situated between 51° and 63° of North Latitude, is a vast sheet of salt water measuring 1,300 miles in length, with an average width of about 600 miles. It occupies the centre of British North America, and drains a territory over three millions of square miles in superficial extent. From Labrador, in the east, and from the Rocky Mountains, in the west, numerous large rivers flow down through Provinces, districts great as Provinces, and vast solitudes into this inland sea; towards the south the extremity of its basin reaches to the sources of the Mississippi. The average depth of this Mediterranean of Canada is seventy fathoms, as stated by Lieutenant Chappelle, R. N., and such is the uniformity of the bottom that Dr. Bell, of the Geological Survey, does not hesitate to assert that, if through any convulsion of nature, the water were to retire, we should see an immense plateau similar to the prairies of the West. There are no rocks or dangerous places to impede navigation; the western shore is low, and affords but one well sheltered, spacious and perfectly safe harbour, Churchill, situated 200 miles from York Factory.

The temperature of the waters of Hudson's Bay in summer is some 14° higher than that of the waters of Lake Superior. Storms are very rare, and by no means formidable, and no icebergs are ever to be met with; fogs are of rare occurrence and short duration. The tide is first felt on the west shore, it runs down towards the south and then up by the east shore. Certain winds are, it is asserted by many persons, periodical.

Towards the south, a deep opening of the land forms James Bay, a kind of prolongation of Hudson's Bay, situated 281 miles from Lake Superior. Its greatest extent from north to south measures 360 miles, its average breadth is about 150 miles. The east coast is woody and the west low and swampy.

The country east of Hudson's Bay is extremely rich in iron ore, according to Dr. Bell. Anthracite is also found there, and lignite in abundance on James Bay.

The waters of Hudson's Bay reach the Atlantic by way of Hudson's Strait, an arm of the sea 500 miles in length, and with an average breadth of 100 miles. The chief outlet of the Strait is only 45 miles wide, between Resolution Island and Button Islands on the north coast of Labrador. The depth of water is over 340 fathoms in the Strait. The current is very rapid and runs as high as 6 miles an hour. The tide rises from 30 to 40 feet. The coast is very high and bold, especially towards the north, the land in many places, as seen by navigators, attaining from 1,000 to 2,000 feet in height. Were it not for the presence of the polar ice, which comes down from the great Arctic seas by way of Fox Strait, during the months of April, May, June and July, Hudsons Strait would, it is admitted by all, be exceptionally safe, owing to the uniform great depth of water and the entire absence of reefs or dangerous islands. These masses of ice, when emerging from the Strait, meet the icebergs from Davis Straits and Baffin's Bay, and are thus retarded on their way to the ocean. This is the chief, if not the only obstacle, which impedes the navigation of the Bay and greatly curtails its duration. The Circumpolar charts, published by the Hydrographical Office of the United States Navy Department, show the existence of a current which passes round Greenland and shows itself to the east of Davis Strait, running towards Baffin's Bay,

and then down in the direction of Labrador, coming in contact in its course, with the rush of waters from Hudson's Strait.

The Bay of Ungava, a sharp indentation of the Labrador coast, lies at the eastern end of Hudson's Strait. White porpoise are here to be found in such large numbers, that according to eye-witnesses, in calm weather the water appears as though it were agitated by a great wind. Salmon abound in all the estuaries, and it is known that the Hudson's Bay Company yearly export large quantities of frozen salmon to the English markets. The same Company have a fort, Fort Chimo, where they carry on a porpoise fishery on a small scale.

The seas we have just described have never ceased to be regularly frequented since they were discovered in 1610, by Henry Hudson, when in search of a passage to China. Champlain the illustrious founder of the city of Quebec, set out that same year (1610) and ascended the St. Maurice, in pursuit of the same end; but he was forced to turn back. He had no better success in a fresh attempt in 1613. Hudson was more highly favored and was the first to reach the Bay and gave his name to this great north sea of the old charts. In 1612, Button visited these same latitudes and gave his name to the group of islands off the entrance to Hudson's Strait. In 1631, Fox made his way further towards the north-west and entered one of the numerous arms of the sea which form the outlets of the Artic waters; it is now known as Fox Strait; the following year James ventured as far as the head of Hudson's Bay and discovered the bay which bears his name. All these renowned navigators were searching for a north-west passage leading towards the Pacific Ocean and the western lands, about which so many marvellous tales were told.

After the period of discoveries comes the history of the attempts made at various times by the merchants of England and of France to explore and take possession of the riches which were believed to be hidden in these new lands. In 1662, Desgroseillers is said to have sailed into these waters; Couture and Duquet took possession the following year in the name of the King of France; in 1668, Radisson, a Frenchman, and Gillam, an Englishman, from New England, built a trading fort; and lastly, in 1670, came the first establishment of the Hudson's Bay Company. From that date until the Treaty of Utrecht, in 1713, the Bay became the theatre of sanguinary conflicts; many a hero there won fame for deeds renowned in story; the navies of England and France made it the field of many a fight, and the forts on its shores were time and again taken and retaken; so that Iberville, writing to the King, said to him, "*Sire, je suis las de conquérir la Baie.*"

This obstinate struggle between two great nations for the possession of a country of which the future value was more than problematical, seems strange to us now. However, the Treaty of Utrecht confirmed England in possession of Hudson's Bay and the adjoining countries, and a gloomy silence fell once more upon those lands buried beneath the snows and ice of their long winters. The Hudson's Bay Company, armed with exclusive privileges, did not remain inactive; for we find, that in 1749, the jealousy of English merchants caused an enquiry by the House of Commons into the condition of the territories watered by Hudson's Bay, and into the trade there carried on. A special committee was appointed, which sat, examined several witnesses, and made a report which has continued to be a matter of lively interest, even up to our own day. With the ostensible object of enquiring as to the means of civilizing those countries, the end, even then, sought was the abolition of the monopoly held by the powerful Company. The latter was compelled to lay before the committee a statement of its affairs, which showed them to be in a most flourishing condition. The most striking result which seems to have followed this enquiry, was the assistance given by the Company to all the hardy explorers who strove then and since, to discover the mysterious and undiscoverable North-West passage. As regards the object in which we are now interested, that enquiry furnishes us valuable information regarding the navigation of Hudson's Bay. Thus the Company state that between 1719 and 1748, they had sent out two, three, and even four vessels a year, and yet there is no mention made of a single disaster or the slightest accident.

It would be curious to compare this enquiry, made nearly a century and a half ago, with some of the evidence collected at the present time by your Committee. It would be observed among other things, that the navigation of these unknown seas was then characterized as safe and comparatively easy;—now this facility of approach and this safety are found to be confirmed in our time. And if the number of vessels sent out by the Company is less in our time, it is because since the establishment of railways to the south of Manitoba, it costs them less to export by this route a great portion of the goods that they formerly dispatched by way of Moose or York Factory.

Besides it is shown by the evidence annexed to this Report, that Hudson's Bay, has for several years, not been frequented only by vessels belonging to the Company.

The hardy sailors of New England, periodically betake themselves to the north part of the Bay to carry on the whale fishery, usually wintering on Marble Island, and sailing back the following season with their vessels laden with a rich booty. Mention is in fact made of an American who has established a post on Hudson's Strait. Fishermen from Dundee, Scotland, also occasionally visit Hudson's Bay.

It is well known that the question of navigating Hudson's Bay has suddenly acquired a new importance. It is ever the problem of finding a North-West passage, not this time in order to reach the China seas, but to gain access to the immense harvests of wheat which await, in the prairies of the west, the European buyer.

Let us suppose, says one witness, the possibility of establishing a line of steamships between Liverpool and the Hudson's Bay ports, which would carry freight at the same rates as the steamships between Montreal and Liverpool;—now the distance between Winnipeg and Montreal is about 1,400 miles, while it is not more than 700 to York Factory. It costs $1\frac{1}{2}$ cents per ton per mile, to forward grain from St. Paul to New York, which applied to the distance to be traversed between Winnipeg and Montreal, would give a charge of $21 per ton, or of $10.50 from Winnipeg to York Factory, say the half. If, now, the ton is reckoned as equal to 33 bushels of grain, the difference in freight in favour of the Hudson's Bay route, would be a saving of 32 cents per bushel, or in other words, an additional profit of $6.40 per acre, yielding an average of 20 bushels. Other calculations make the saving one-third the present cost of transport realized by the farmer of the West, upon the opening of a channel of exportation by the Hudson's Bay. A large proportion of importation from Europe would take this road; the immigrants proceeding westward would see that they could shorten the annoyances, the delays and the costs of a journey across the continent by some 800 to 900 miles; the export of butchers' meats would alone furnish a considerable portion of the lading of Hudson's Bay steamers; and many persons are of opinion that this route would command a considerable portion of the import and export trade of the north-western States of the Union. We speak merely incidentally of the Hudson's Bay fisheries, and of the working of the minerals, almost inexhaustible in their richness, which are to be found there. To sum up the whole, Hudson's Bay appears to us to be destined to perform the same service for the vast territories of the North-West that the Gulf of the St. Lawrence does for the vast and fertile valley bearing the same name. Churchill is 2,926 miles from Liverpool; Montreal is, 2,990 *vid* Cape Race, and New York, 3,040; there is, therefore, a difference of 64 miles over the route by Montreal, and of 114 miles over that by New York, in favour of Churchill.

If we sum up the evidence collected by the Committee, as to the present condition of the navigation in Hudson's Bay and Strait, we find that the great majority of those who have been there, and consequently who know, reckon the duration of navigation in these waters at three and four months. For more than two hundred and fifty years, sailors have counted upon having an uninterrupted navigation of from two months and one-half to three months, and this without marine charts, without an accurate knowledge of these waters, without lighthouses, without a system of telegraphic communication, and without the aid of steam. It is not then an unwarranted belief, that with all the appliances now at the disposal of nautical science, this navigation will be prolonged for some weeks.

In 1716, Captain Vautrou wrote that of all known countries, the navigation of the Gulf of St. Lawrence was the most difficult and the most treacherous. From 1684 to 1730, the wrecking of seven large vessels, belonging to the King, in the Gulf was recorded; the loss of these vessels, loaded with merchandise of the most valuable description, several times caused the most extreme embarrassment to the colony. Of three expeditions fitted out by England to seize upon New France, and sailing through the Gulf of St. Lawrence, only two were able to cast anchor in the harbour of Quebec. Everybody has heard of the disaster which overtook Walker's fleet in 1711.

Only one voyage each year was then made, and it was alleged that the St. Lawrence was frozen solid in winter.

What a contrast between the navigation of the St. Lawrence then and now. Owing to the intelligent and persevering efforts of the Government of Canada, magnificent harbours have been created; a powerful and numerous fleet takes its way every year, in almost complete safety, as far as Montreal, spreading everywhere energy and wealth, and the export alone of grain, by this noble route, reached the figure of 10,500,000 bushels, in 1882.

To declare that it will be time enough to pay attention to the question of navigating Hudson's Bay when the railways become insufficient to move the traffic of the North-West, appears to us to be an erroneous view to take of the matter. What we have to do is to promote production by offering to it new and more favorable conditions.

There also results, from the evidence gathered by your Committee, a necessity for the Government to examined a great number of questions intimately connected with the navigation of Hudson's Bay and Strait.

Without the intervention of the State, this navigation will remain what it is at the present moment: uncertain, of short duration, without any attraction for capitalists. In this direction, several have set forth their opinions as to the nature of the examinations which the Government might have made, and as to the organization and character of a proposed surveying and exploring expedition.

They almost all agree in stating that these observations should cover a period of at least three years, and should be conducted by means of observatories, erected on the shores of the Strait, as well as on certain places on the coasts of Hudson's Bay.

Cape Wolstanholme, Nottingham Island, the neighborhood of North Bay, Cape Hope, Resolution Island, and one of the Button Islands, have been pointed out as localities which might be selected

The meteorological and astronomical phenomena, the currents, the temperature of the waters, the tides, the movement and nature of the ice masses, some hydrographical bearings, &c., such would be, or nearly so, the work entrusted to the head men at the stations. The Government would succeed, in this way, in establishing a knowledge upon a number of essential points, relating to the navigation of these unknown waters, and would prepare the way for capitalists desirous of essaying the opening of this grand road to the North-West

The breaking up of the rivers which fall into Hudson's Bay, as well as the date of the formation of the ice upon these rivers and upon the beach of the Bay, are of course the important facts which it is necessary to take into account, in order to determine the duration of navigation. From the tables given to the Government by the Hudson Bay Company, in 1880, it appears that the breaking up of the Hayes River at York Factory, for a period of fifty-three years, took place, on the average, on the 15th May; the mean of the formation of ice gives the 20th of November, which would give an average of five months or thereabouts of navigation. We know that the 1st of May is the usual date of the opening of Montreal harbour, and the 25th of November that of its closing. The point would be to ascertain, for certain, this fact. not only as to York Factory, but Churchill harbour and various other places on the shores of Hudson Bay. The information hitherto collected only applies to a very small number of ports.

Your Committee beg to submit, with this Report, all the evidence taken in the course of the investigation, some of which will be found of the most interesting character.

In concluding this Report, your Committee believe it to be their duty to remark upon the absolutely impartial character of their labours. Undertaken without reference to preconceived opinions the enquiry has been conducted in a manner well calculated to throw the greatest possible amount of light upon the conditions and character of the navigation of this portion of our maritime Dominion. The information obtained cannot be said to form a complete examination of the question; but your Committee are satisfied if they have been able, by their efforts, to contribute to the critical examination, and solution of a problem which will assure to Canada an immense development of its marine, the monopoly of the traffic of the North-West, and a fresh pledge of prosperity and grandeur.

The whole of which is respectfully submitted.

J. ROYAL,
Chairman.

EVIDENCE.

THE QUESTION OF THE NAVIGATION OF HUDSON'S BAY.

HOUSE OF COMMONS, OTTAWA, 22nd February, 1884.

The Select Committee appointed to take into consideration the question of the Navigation of Hudson's Bay, met this morning, Mr. Royal in the Chair.

EXAMINATION OF DR. BELL.

ROBERT BELL, Esq., LL. D., M. D., Senior Assistant Director of the Geological and Natural History Survey of Canada:—

By the Chairman:

Q. What opportunities, Dr. Bell, have you had of becoming acquainted with Hudson's Bay and the surrounding country?—In the course of my professional duties, as geologist and explorer, I have had occasion to visit either the immediate shores of the Bay, or the country surrounding it, during six of our working seasons.

Q. Consecutively?—Nearly consecutively, from 1875 up to 1881, both years inclusive.

Q. What knowledge have you of the Hudson's Strait?—I have passed through the Strait on one occasion in the Hudson's Bay Company's ship—this was in 1880—on a voyage from York Factory to London, and I have been up nearly to the Strait in a previous year, 1877, and on all occasions, both when in the Strait and on the coasts of Hudson's Bay, I have collected a great deal of information, personally as well as from others with whom I have discussed these matters. Besides this, I have read all that I can find that has been written on the subject.

Q. Are you acquainted with the country between Manitoba and the Hudson's Bay, and also the country between the Great Lakes and James Bay?—Yes; in the years I have referred to, I made surveys, as much in detail as possible, of the routes I used in travelling, both between Winnipeg and the Hudson's Bay; and again during several years I have explored and surveyed the region between Lakes Huron and Superior, on the one hand, and James Bay on the other.

Q. Have you any knowledge of engineering?—I have, although I am not a practising engineer. I studied practical engineering for three years, taking a full college course at McGill University, Montreal, in that profession. I hold the diploma of Civil Engineer. I know enough about engineering to be able to judge of the aspects of a country in regard to railway construction and otherwise.

Q. What is your opining as to the feasibility of building a railway from Winnipeg to Hudson's Bay or James Bay?—As far as I could judge, there appeared to be no special engineering difficulties. The country all the way from Lake Winnipeg to Hudson's Bay, say to Churchill or York Factory, appeared easy for the construction of a railway. I have seen more than merely what one might observe from a passing boat. I have gone inland in many places, and have had various means of judging of the country in both of the sections you refer to.

Q. Would it be difficult to construct a railway from Lake Superior or Lake Huron to James Bay?—I think not; the country is tolerably well adapted for the construction of a railway, and especially in the direction that such a railway would take. At the same time, it might be difficult to build a railway across the trend, or parallel to the natural features. It might be easy to follow the direction of the rivers which flow into Lake Huron or Lake Superior. Into Lake Huron, they flow southward, and into Lake Superior, they flow south-westward; and on the other hand from the height of land in continuation of the valleys leading up from Lakes Superior

and Huron, they run northward and north-westward. I venture to say that a line easy of construction might be found in different sections.

Q. Do you consider that Hudson's Bay and Hudson's Strait are open for navigation long enough each year to be utilized for ordinary commerce?—It appears to me that they are, and from my own personal observations, and from what I can learn one the subject, both the Bay and the Strait are open long enough for the ordinary purposes of commerce, perhaps to the extent of four and a-half months in each year, and possibly more; we do not know positively, but the chances are in favour of it being open longer. From what is already proved, we know them both to be open for four and a-half months at least.

By Mr. Foster:

Q. What months are those?—Say, from the middle, and certainly from the end of June until the middle of November.

By the Chairman:

Q. How then do you account for the popular notion to the contrary, which has prevailed until recently?—This idea has arisen in various ways. Canada generally, in the Old World and perhaps in the United States, is considered to be more Arctic in its character than we know it to be, and the same opinion seems to prevail in a greater degree with regard to the region in question; and then very little has been known except to gentlemen who are interested in the fur trade, who are not supposed to give any information; and then again, the tendency of all travellers, missionaries and explorers has been to exaggerate their difficulties, as all writers will. Sea captains do not wish to give away their knowledge or to make their troubles appear less than they are, and the same thing applies to other gentlemen who have been there; they like to tell a good story, as to what they have done and endured for their country, and in that way what little has been known has been rather coloured adversely to the country itself.

Q. What surveys have you made between Lake Winnipeg and Hudson's Bay?—I have made several; in the first place, the boat route, which is followed or travelled from Lake Winnipeg to York Factory, by way of Norway House, Oxford and Knee Lakes, the Hill, Steel and Hayes Rivers. These streams are continuations of the same waters. Hill River is an upper branch of Steel River, and they both ultimately form Hayes River. I have surveyed that route throughout, from Lake Winnipeg to Hudson's Bay, and I have surveyed Nelson River itself, from Lake Winnipeg to the sea, including numerous "lost" channels. I have also surveyed another route, which leaves Nelson River some distance down, and crosses a narrow strip of land, and falls into the upper waters of the Little Churchill River, which again joins the Great Churchill River, and this river I followed to the sea coast.

Q. Have you surveyed Lake Winnipeg?—I have made the principal surveys which exist, so far, of Lake Winnipeg. I have made track surveys of the northern parts and the east coast, all the way from the outlet to the Red River, and a considerable portion of the west shore—that is to say, from the Dog's Head to the Red River.

Q. Have you seen much of the country on each side of the Lake—on the west as well as on the east side?—I have seen enough, I think, to form an idea of the nature of the country. I have traversed the country between the east side of Lake Manitoba and the west side of Lake Winnipeg. I have been up some of the rivers for a few miles, and I have also travelled through the woods, here and there, on the east side. One of my assistants, Mr. A. S. Cochrane, has surveyed all the principal rivers on the east side, and reported the result of these surveys, all the way from Winnipeg River to the outlet. I have surveyed the Winnipeg River myself the whole way from the Lake of the Woods to the outlet, and also its principal branch, the English River. Although so much traversed, the Winnipeg River had never before been surveyed except in parts.

Q. Would it be difficult to construct a railway on either side, from what you know?—I think not. There would be local difficulties to encounter, but nothing of an extraordinary or unusual nature. The difficulties would be small, considering the distance. It might, perhaps, be found very easy, for all we know, on both sides. On

the west side there are very long " muskegs " that run parallel to the course to be followed. On the east side the country appears to be drier, but it is traversed by numerous small streams, running from the east to the west, and falling into the Lake; at the same time, the country is, in a general way, tolerably level. There are no great elevations, and when you come to walk over the ground, it looks very level in most parts, and much drier than on the west side.

Q. Is it anything like the country traversed by the Canadian Pacific Railway between Port Arthur and Rat Portage?—The country you speak of is more difficult for the construction of a railway than the one I have referred to.

By Mr Foster:

Q. I see there is a height of land marked on the map on the east side, about one-fourth of the way to Hudson's Bay?—It is scarcely a height of land on that route. The Nelson River flows across it, but from the point indicated on the boat route, it has a south-easterly course, the divide becoming higher in that direction. Following the boat route just referred to, the divide is very low and short, only a few yards in length, being merely a flat rock, over which the boats are hauled, and scarcely perceptible as a height of land.

By the Chairman:

Q. Is the country between the great lakes and James Bay difficult for railway construction?—I should think not; as I mentioned before, speaking of the country generally, between the great lakes and James Bay, there are no engineering difficulties, in the particular direction indicated, as you follow the general thread of the watercourses.

Q. What advantage, to Canada generally, and the North-West in particular, would accure from the opening of the Hudson's Bay route?—I think it is manifest that the advantage would be very great inded, and it is a matter, just now, of very great importance. The cost of the transport of wheat, for example, to the markets of the world, say Great Britain, is reduced to the very lowest point by competition with all the world, and consequently, if our wheat regions of the North-West were labouring under any disadvantage, as far as carriage was concerned, the price must necessarily be reduced to meet this competition. It is, therefore, essential to successful farming in our North-West that we should have an easy and cheap route to the markets of the world; and also for carrying heavy freights from Europe to the North-West, such as iron and heavy goods generally, it is very desirable to have as short a land carriage as possible. As a route for immigrants, the ocean route being as short as to other ports, and the land route being much shorter, it would afford a cheap and direct way of bringing immigrants to the North-West; and the importance of it is enhanced by the fact, that we could keep them to ourselves; whereas, if they were brought in by the present routes, they run the chance of being tampered with by the immigration agents of the United States. It might also be valuable for the export of bulky, low-priced agricultural products, such as potatoes, pressed hay, etc. Then the coolness of the route, as well as its directness, would be of great advantage for the export of fresh meat and dairy products. Again, if this route could not be made available for the export of live cattle, we might not be able to export them at all—a serious consideration for the great ranching country in the North-West.

By Mr. Paint:

Q. Is the land arable in the vicinity of Fort Churchill and the Nelson River?—There is very little soil about Fort Churchill, but there is land on the Nelson River near to Hudson's Bay. It cannot, however, be said to be a farming country owing to the unfavourable influence of the immediate vicinity of the sea in such a northern latitude. It is not from the extreme cold of the sea, but from the continued coolness and want of high temperature necessary to bring crops to maturity which require a temperature of certain intensity during one period of their growth, and which they cannot get owing to the proximity of the sea. On the other hand during the winter this sea has a modifying influence which is quite favourable, preventing extreme cold in winter.

By Mr. Foster:

Q. A railway there at the most, would not have more than five months traffic in the year?—It does not follow that because the harbours are shut up in the winter a railway could not be operated.

Q. Why should you not have large elevators there?—Large storehouses and elevators might be built and filled up with goods from the ships and wheat from the interior. During winter these goods and the grain could be carried by the railway. The road might also be used for carrying the Company's own materials.

By the Chairman:

Q. Would you please describe Port Nelson?—There is no such port. Notwithstanding that it is a name frequently used, I do not know where to locate it. Off the mouth of the river there is an open roadstead in which ships anchor, probably 20 or 30 miles from the shore, and from this a shoaling channel might be followed up into the Nelson River, becoming narrower to the head of tide-water, where I found the depth was only 10 feet.

Q. What harbours are there on the western coast of Hudson's Bay?—The Harbour of Churchill, but possibly there are others farther north.

By Mr. Paint:

Q. Nelson River has a bar. What is the depth of water inside of this bar?—I do not know of any other bar than the one referred to. Although the water is only 10 feet at this bar, the inland channel of the river is 20 feet deep.

Q. What is the greatest depth of the tidal portion of the river?—I have sounded it all along; at low tide it is probably two fathoms and upwards.

Q. How far does the 20 feet extend?—The tide just reaches to the ten-foot bar referred to, and no more, but above it there is a depth of 20 feet for 50 or 60 miles.

Q. How wide is the river at that point?—Rather less than a mile wide at the head of tide, and at 50 miles from this point probably less than half a mile. The river is still deep at this distance, and has a velocity of from two and a-half to three and a half miles an hour.

By the Chairman:

Q. Are there any good harbours on James' Bay?—The harbour at Moose Factory appears to be pretty good for the ships of the Hudson's Bay Company, which frequent it.

Q. Where is Moose Factory?—Moose Factory is situated at the south-western extremity of James Bay. There is a roadstead there in which the ships on arriving first anchor, and after securing a pilot or convoy, they move up to their inner anchorage—to what is called the inner ship-hold, or hole, at which they unload their cargoes five or six miles below the fort. The factory is situated on an island in the river, but still in tide water. The tide runs some distance above it. It is a good-sized island, being between two and three miles in length.

Q. Do you know if harbours exist on the east side of Hudson's Bay proper?—Yes; there are some good harbours beyond Cape Jones on the east side of Hudson's Bay proper. Immediately on leaving James Bay, on the east coast the shore trends north-easterly from this Cape, and numerous good harbours are met with. Where the good harbours referred to are found on the east shore, the coast is bold and rocky with plenty of deep water and commodious harbours accessible at all stages of the tide.

Q. There is a certain notion that between the east coast of Hudson's Bay and a long bay further east, there is an open passage or strait?—I have not been in there myself, but I have observed on all the old maps that the channel is indicated, and I do not suppose that there has been any authority for altering the map since then.

Q. Between what bays?—The western arm of Ungava Bay is call Bay of Hope's Advance, and the other is Mosquito Bay. It is represented as running between these two.

Q. Would that shorten the voyage by sea?—Yes it would, apparently, to a considerable extent, and it would avoid the ice which might be in Hudson's Strait. It is not likely that there would be any ice in a narrow channel like that, if such

exists. The channel would be about 200 miles long, striking Hudson's Bay about 100 miles south of the Strait.

By Mr. Paint:—

Q. Was the existence of that channel ever tested?—I do not think it has been sufficiently tested. At one time a small vessel was sent in by Mosquito Bay, which, however, returned without having satisfactorily cleared up the question.

Q. Who sent that boat?—I think it was the Hudson's Bay Company, but, I do not think they carried out their instructions to a satisfactory conclusion. Another reason for supposing that that channel exists is, that the cariboo, in their migrations from the south to the northward, do not appear to go to the Hudson's Strait, but turn eastward and come out at Ungava Bay, moving as if their progress had been interrupted before they could reach the shores of the Strait.

By the Chairman:—

Q. Will you please state the relative position of Churchill, as compared with other ports and routes which might be affected by it?—Churchill is situated at the extreme western part of the Hudson's Bay, and that point is as nearly as possible midway between the Atlantic and Pacific shores of America, rather nearer, indeed, to the Pacific Coast than to the general outline of the Atlantic coast. At the same time it is at a shorter distance from Liverpool than Montreal, and considerably shorter than New York. The distance from Churchill to Liverpool is 2,926 miles, or 64 miles nearer than Montreal, which is 2,990 miles by way of Cape Race, and 114 miles nearer than New York, which is 3,040 miles from Liverpool. It will thus be seen that it has a little advantage over Montreal, and a considerable advantage over New York.

Q. Will you please give the Committee your reasons for supposing that Hudson's Strait is not frozen up in the winter?—In the first place, the latitude is not so high as to give a frozen sea generally, and then, as we know, the tides set in and out of Hudson's Strait with considerable velocity; sufficient, at any rate, to prevent ice forming, and the rise and fall of the tide is so great as to help to break it up very rapidly; and, besides, we have no evidence that the Strait is closed, but rather that it is open in the winter. The Esquimaux, from the north side of the Strait, are seldom able to cross to the south side, in order to trade at the posts of the Hudson's Bay Company, and succeed in doing this only about once in ten years, and then not on the solid ice, but on floating ice-fields. It has been recorded that vessels have gone through Hudson's Strait in the depth of winter, after Christmas; so that in view of these facts, it is reasonable to infer that the Strait is open rather than closed during the winter.

By Mr. Paint:

Q. Was that vessel ice-bound?—Yes; it had gone into an inlet in Hudson's Strait for some purpose, and an ice-field closed up the entrance, but this, for some reason, afterwards cleared away, and the vessel set sail again and passed out of the Strait.

By the Chairman:

Q. Are ice-bergs met with in Hudson's Bay?—No; ice-bergs, as you are aware, are formed first as glaciers on land, which sliding off the land into the sea, at last attain a depth of water which buoys them up and breaks off large fragments, which now form ice-bergs. No such conditions exist around Hudson's Bay, and consequently there are no ice-bergs.

Q. What is the nature of the ice which is sometimes found in Hudson's Bay?—All tolerably thin or shore ice, formed during the winter, whereas to form an ice-berg might take hundreds or, perhaps, thousands of years, by the slow accumulation of the snows of succeeding winters. Thin ice forms during the winter near the shore, is not formidable, and floats off in spring just as the ice does in our lakes.

By Mr. Foster:

Q. How far from the shore does this thin ice form?—It varies according to circumstances, being widest where the water is freshest, shallow or sheltered by points or islands. On the other hand, where the water is deep or the shore is bold, little or no ice forms. I have in my collection of photographs one taken in the depth of winter,

which proves that the water was open at the locality at which it was taken on the east shore. On some parts of this coast I am told that in winter the open water washes up against the bold rocks just as it does on the coasts of Nova Scotia and Newfoundland.

By Mr. Paint:

Q. On what part of the coast were these photographs taken?—About the middle of the East-main coast.

Q. Would there not be a tendency of James Bay being jammed with floating ice when Churchill and Port Nelson would be open?—Yes; that might happen if there were long continued winds from the north, whereas, if the winds had been from the south and east, James Bay would be clear, and ice might be found in the western part of the Bay.

By Mr. Foster:

Q. What are the prevailing winds?—In the early spring they appear to be variable, but when the warm weather sets in, they are generally from the south and south-westward.

Q. Would that clear James Bay then?—Yes. With regard to the positions of the drifting ice, it is very frequently formed in the centre of the Bay. This may perhaps be accounted for by the circling route of the tidal wave, which flows westward from Hudson's Strait, and strikes the west coast of the Bay before the east, passing southward to James Bay, and being apparently reflected up the east coast. This tidal wave, in conjunction with certain prevailing winds, might be the cause of bringing the ice to the centre of the Bay. It is also found sometimes between York Factory and Churchill, and at the entrance of the Strait.

Q. Could steamers force their way through such ice?—Yes; a steamer would have no difficulty in doing so. It is thinner ice than I have passed through between Halifax and St. John's, Newfoundland, in the middle of winter, but it is not so universal as would necessitate passing through it at all; vessels could go round it. The difficulty with sailing ships is their inability to get round these fields of ice. A ship which could move independently of wind or tide, would have no difficulty whatever.

By Mr. Desjardins:

Q. They do not use any steamers there as yet?—No steamer has yet sailed in Hudson's Bay.

By Mr. Paint:

Q. Do any of the steam whalers reach Hudson's Bay?—No. I have never heard of any doing so. They are mostly barges and schooners from New Bedford, New London and Gloucester, in New England.

Q. Any whalers from Dundee, Scotland?—Yes, sailing whalers, but no steam whalers have gone there as yet.

By the Chairman:

Q. During what length of time would the waters of both the Hudson's Bay and Strait be open for navigation?—About four and a-half months. An exploratory steamer might prove it to be very much longer, but unless we could get into the harbours, there would be nothing gained by entering the Bay. Navigation would be open for a limited season, at any rate, unless there is some unknown obstruction in Hudson's Strait.

Q. You have seen and read a great deal about this question—who was the first to propose the Hudson's Bay route?—So far as I am aware, it was the late Andrew McDermott, of Winnipeg. He came out in 1812, and as soon as railways were being begun in other parts of America he thought it would be a good idea to build a railway from Winnipeg to Moose Factory. As soon as any railroads were known, he spoke of the great advantages which would accrue to the Red River settlement, by having a railroad to Moose Factory. He seemed to think that that was the most feasible. There would be no great difficulty in building a railway along the line indicated, which is pretty much the same as that now followed by the Canadian Pacific Railway as far as Wabigoon, thence going down the valley of the Albany

River, Moose Factory could be reached. That was Mr. McDermott's idea. Then in 1848, Colonel M. H. Synge (then Lieutenant) in a small work which he published on Canada, suggested that this might become a great route for trade with the interior. In 1864 Prof. Hind favoured this route in a paper which he contributed to the Statistical Society. The next was probably the Hon. Henry Clarke, of Winnipeg, who, I understand, claims to have suggested the opening of this route about 1872. I might mention that I discussed this subject myself in 1869 with prominent men in Montreal, such as Mr. Keefer, the Civil Engineer, the Hon. John Young, Professor Armstrong and others. In 1878 I was asked by Col. Dennis to write an account of this route for the Minister of the Interior, and that account is found in the report of the Minister of the Interior for 1878, and during the same year the Hon. Mr. Ryan brought the matter up in the Senate, and since that time it has been pretty generally discussed. I remember reading in the newspapers long ago, suggestions of this sort, but I really forget the names of the authors. Of those I have mentioned I recollect the dates pretty distinctly. In 1881 I presented a paper to the Royal Geographical Society on the commercial importance of Hudson's Bay, and also in the same year I wrote an essay on a new route from Europe to the interior of North America, with a description of Hudson's Bay and Strait, and my reports of the Geological Survey from 1875, to the last one issued, enter considerably into this question.

Q. You are said to have originated the statement so frequently quoted of late that some 730 round voyages have been made into Hudson's Bay. Will you please inform the Committee how you arrived at this number?—I took the actual number of Hudson's Bay ships recorded, with dates and the minimum number which must have been employed, though unrecorded; also the ships of discovery and exploratory ships, vessels of war, American and Scotch whalers, and by adding all these together I got at this number.

Q. That is up to what year?—Up to two years ago.

By Mr. Paint:

Q. From what date?—Beginning in 1609 or 1610, when Henry Hudson first entered the Bay.

By the Chairman:

Q. Have losses and disasters been of frequent occurrence in these waters?—No; the facts are strikingly the other way, showing very few losses during that period.

Q. From 1610 to 1882?—Yes; very few disasters.

Q. That is 272 years?—The losses and disasters have been much fewer than we might have expected. The first vessel that came was that of Henry Hudson, the navigator, which safely returned in charge of common sailors. Hudson appears to have wintered in Rupert's Bay, in the south-eastern extremity of James Bay, leaving which, in the spring, his crew mutinied when the vessel was somewhere near the east shore of James Bay. Here the crew set the captain and part of the ship's company adrift in an open boat. On reaching Cape Wholstenholme, at the entrance to Hudson's Strait, they went on shore to kill wild fowl for provisions for the remainder of the voyage. Here they were attacked by the Esquimaux and considerably reduced in numbers. Notwithstanding the disadvantages arising from this fact, and the shortness of provisions, they reached the coast of Ireland in safety, and eventually London, where they surrendered themselves to the authorities. I think that this proves that the navigation of the Bay must have been easy and safe.

Q. Are you aware of the rate of insurances on vessels to-day into Hudson's Bay?—I have understood that the rate from London was as low as to any other port in the world, being 1 per cent., and lately the Hudson's Bay Company do not insure their ships at all, owing to the fewness of the disasters in the past, apparently considering it a waste of money.

Q. So safe are these waters considered?—Yes.

By Mr. Foster:

Q. Are there any artificial aids to navigation at all?—No; except those at the ports of Moose Factory, York Factory and Churchill, and these are merely for harbour purposes, and very insignificant.

Q. Do you not suppose that artificial helps would be of great assistance?—I do not know that they would be of much assistance in the Strait, because the coasts are so bold. The water is so deep and the shores are so high that probably they would be seen on the darkest night, and then in summer there is almost no night in the Strait. Of course, lights might be useful at some low points in the Bay.

By the Chairman:

Q. The days are very long?—Yes; in the the long days, the sun scarcely sets, and the twilight continues during the night.

Q. Navigation there, then, would be safe?—Yes.

By Mr. Paint:

Q. How were the soundings obtained, which are on the chart which you exhibit?—By the Hudson's Bay Company; whether at their own expense or not I do not know. This chart is only used by them. It appears to be out of print now.

Q. There is a good depth of water through the Bay?—The average depth is 70 fathoms. It has a very uniform depth, and if the Bay were drained it would be a wide level plain.

Q. What about the character of the climate with reference to storms? Are storms of frequent occurrence?—My own experience is that the Bay is totally free from storms. There are certain points, notably at York Factory, where the wind is very variable, and the aggregate mileage travelled by the air is very great, but it seems to be, however, quite local. The Bay is considered very tranquil, as a rule, and in my own experience, on a boat voyage along the sea coast, I found it so. We sailed, day after day, with fair, southerly winds in going up, but in returning we had to fight against this prevailing wind. My object was to get back to Moose Factory in time to catch the ship sailing thence to London that autumn, but owing to the almost perpetual head wind, we failed to make this connection, and, after losing a considerable time, I found myself at Fort George, some 300 miles from Moose Factory. Here a change in the wind set in,and, having gained courage from our past experience of the Bay, we resolved to make for Moose Factory direct, which had never been done before in an open boat. We touched at two or three headlands, or islands, to get water. The whole voyage occupied three days and two nights.

Q. What kind of boat had you?—A schooner's jolly boat.

By Mr. Dawson:

Q. You have not explained about the temperature of the water on that voyage of exploration?—No; of course coasting in a small boat I had the advantage of taking the temperature of the water on many occasions. On calm days the temperature was very high. On such days I got the true temperature by lowering the thermometer with a string, and on other days when the wind was blowing, I got a very fair temperature by holding it near the surface. The mean of these observations gave 53 degrees Fahrenheit.

Q. How far north did that continue?—As far as Cape Dufferin, on Portland promontory. This map on the wall shows the portion of the East-main coast, about 250 miles in length. which I surveyed during the season referred to, being from Cape Jones to Cape Dufferin.

Q. This temperature that you found in Hudson's Bay is very much higher than in Lake Superior, is it not?—Yes.

Q Without discussing the reason for it, the fact remains that the Lake Superior water is cooler than the water of Hudson's Bay?—Yes.

Q. It is never above 39½ degrees in Lake Superior?—No; not far above the freezing point a short distance below the surface. The voyageurs I had on the occasion referred to were from Lake Superior, and they were astonished at the difference in the weather and in the temperature of the water, &c., in Hudson's Bay. They discussed among themselves the reason for it, and came to the sensible conclusion that it was because the sun shone longer every day and the sky was brighter. Perhaps it is because there is no ocean current in Hudson's Bay, so that the waters remain, and the heat accumulates from day to day. Whereas, on the Atlantic Coast, a fresh supply of icy water is constantly brought down from the north.

By the Chairman:

Q. Have you in your possession the lists of arrivals and departures of the Hudson's Bay Company's ships at York Factory and Moose Factory?—Yes; I have seen the books in which these are kept for a long period, both at Moose and York Factories. Believing that it would be of importance in regard to my report, one year, to mention these, I requested Mr. Armit, the Secretary in London, to give me the list for Moose Factory, and Mr. Fortescue, that for York Factory, both of which requests were acceded to. Moose Factory covered 147 years, and York Factory 96 years. They have been extended since then, there being three years to add now.

By Mr. Foster:

Q. Has that record been published?—Yes, in my official report for 1880.

By the Chairman:

Q. Are you aware that two of the Hudson's Bay Company's ships ran ashore in one year?—Yes; I suppose the two ships referred to would be the "Prince of Wales" and the "Prince Arthur." They got ashore on the northern part of Mansfield Island, immediately after going through the Strait, in 1864, while making for York Factory. It seems that a little while before striking on Mansfield Island, they had fallen in with some American whalers—I had the story from an officer of one of the ships—it appears that they had fallen in with some Americans on whalers—a barque and a schooner—and that the officers were visiting, as they called it, on board one of the vessels, leaving the common sailors to navigate them. The sea was smooth, and a light, fair wind was blowing; all studding-sails were set, alow and aloft, on both sides, and they were bowling along beautifully, and apparently in no danger. The wheelsmen had no option but to sail on in the course which had been given them; they knew nothing about the tides and currents which were sweeping them rapidly to the south. The Hudson's Bay ships, which were leading, both struck the shore, but the Americans managed to get off altogether. Next morning, my informant went off to take a walk on the island, and he had not gone far, when, to his surprise, he met some of the men from the other ship. They each exclaimed, "How came you here?" and for the first time each learned of the other's accident, and it turned out that the ships were only a mile or two apart. Both had gone on shore near the top of high water, and it was found impossible to get one of them off; the other, however, the "Prince of Wales," got to York Factory. That ship is still sailing in the service of the Company.

By Mr. Foster:

Q. It was due to mismanagement, then?—Yes; but that fact is quoted to show that Hudson's Bay is not navigable.

By Mr. Dawson:

Q. At what season of year did that occur?—I think about the middle of August.

By the Chairman:

Q. Is Hudson's Bay subject to storms?—I have already spoken of my boat voyage, which was free from storms. In the voyage referred to, from York Factory to England, the winds were mostly light, and the delay in getting through the Strait arose from too little wind.

Q. What time of year was that?—At the end of September, and the first half of October. I mean the second voyage I spoke of; the boat voyage was in the months of July, August and September.

Q. What is the extent of Hudson's Bay?—The northern part is not very well defined, but the average length would be about 1,000 miles, and the extreme length 1,300 miles.

Q. Would that take in James Bay below?—Yes.

By Mr. Dawson:

Q. And what would be the width?—The average width of the Bay proper is about 600 miles, so that the area would be something less than half a million miles, although it is sometimes given as greater than this.

Q. And from the mouth of Nelson River to the Straits would, I suppose, be nearly 1,000 miles?—No; I should think about 700 miles.

By the Chairman:

Q. And from the mouth of the Churchill River?—Rather less.

By Mr. Foster:

Q. After you get outside of Cape Chudleigh, what is the character of the navigation? Is it obstructed?—It is liable to icebergs, at certain seasons of the year, which impinge against the shores of Labrador, and there might be a little difficulty there, just as we have sometimes in approaching the St. Lawrence. It is the same stream of icebergs which is met with on the coast of Newfoundland.

Q. But the stream is narrower at Davis' Straits?—Yes.

Q. Is the width of that stream of icebergs at all defined?—The width varies very much.

By the Chairman:

Q. Will you please give the Committee a short description of the shores of Hudson's Bay, and those of the Strait also?—In a general way, the western shore of Hudson's Bay is lower than the eastern. Beginning at the southern extremity, we have very low shores on the west side of James Bay, as far as Cape Henrietta Maria; that is where you pass out of James Bay into Hudson's Bay. West of that again, it is low all the way to Churchill. The shores are extremely low and the water shallow, and then at Churchill it begins to be rocky and higher, and the water deeper, but still, from Churchill northward, it is not at all a bold shore, as far as I have gone.

By Mr. Paint:

Q. At a mile from shore, how much water is there?—Not more than a fathom of water.

Q. And two miles from shore?—About two fathoms of water, on the average, generally, in the parts I have spoken of as low; it would not apply to Churchill or Cape Henrietta Maria. At Churchill the water is deeper, as it is rocky there, although the land is not high.

Q. The reason I asked was, that on the shores of SouthCarolina and North Carolina, &c., they have a general rule that one mile from shore corresponds with one fathom, two miles from shore with two fathoms, and so on.—I was not aware of that before. If we go to the eastern side of James Bay, beginning at the southern extremity, and extending as far as Cape Jones, it is something like the north-east shore of the Georgian Bay, Lake Huron, a labyrinth of islands, points and bays. The nucleus of many of the islands is rocky, and a great many of them are gravel and sand. The shore back from them is comparatively low, but as you get round Cape Jones the shores get rapidly high and bold. It has a different geological formation. Part of the shore I have surveyed, and represented on the map on the wall, rises to a height of 2,000 feet. Going north again, when you reach Cape Dufferin, it is moderately low, but rocky, and the water is deep. The rocks of the 250 miles, which I surveyed, are of the age of the Nipigon series, which are largely developed on Lake Superior, and the dip of these rocks is westward, or from the land into the sea, and the result of that is that the islands present a bold face towards the shore, and all the hills present escarpments inland, gently sloping the other way into the sea. The shore again rises in going from Cape Dufferin northward to Cape Wolstenholme, and there again it is from 1,000 to 2,000 feet in height. The shores of Hudson's Strait are all bold. The Strait itself measures about 500 English miles in length, by an average of 100 miles in width. The narrowest part is about the centre, and at the outlet into the Atlantic the breadth is only about 45 miles, but between these points it is very much wider, so that the average would be about 100 miles. The water in the Strait is deeper than in the Bay. The depth in the Bay is 70 fathoms, and in the Strait from 100 to 340 fathoms. We let down the deep-sea lead to 150 fathoms, but it was hard work to hold it up even at 150 fathoms, and to save the sailors unnecessary labour, we let it down no deeper. But on the chart, the soundings are marked as deep as 340 fathoms.

By Mr. Foster:

Q. Have you any particular knowledge of Ungava Bay and country?—Not much. I have seen the east shore of Ungava Bay, near the Button Islands. This region has been described to me by Mr. McLean, Capt. Kennedy, and by Mr. Robert Crawford, now of Brockville, who have lived at Fort Chimo. It has also been visited by Staff Commander J. G. Bolton, and others. Any of these gentlemen might inform the Committee from personal observations in regard to the Ungava region. In regard to the shores of the Strait, they are bold in a general way. The southern shore is more precipitous and steeper than the northern shore, which is equally high, from 1,000 to 2,000 feet all along, but slopes very gradually up. You can see the hills 15 or 20 miles inland, whereas you do not see anything but the face of the rock on the south shore. In passing through the Strait, I made frequent observations of the shores. When we were sailing in the Strait, we went so frequently from side to side, that I had many opportunities of getting views from all points. It took us about three weeks to get through, and we were carried from side to side constantly.

By Mr. Paint:

Q. Did you meet with any ice?—Yes; we met with a little field ice.

By Mr. Foster:

Q. Did you form any idea of the mineral capabilities of the eastern or western shore of the Bay?—The chief object of my trip was geological exploration, and we learned as much as possible about that on both sides. Many parts appeared favourable for minerals, but we did not spend much time searching for individual mines which we might not find, but we were quite sure that we could do some good by ascertaining the geology of the country. The best section on the east side for minerals was between Cape Jones and Cape Dufferin, about 250 miles in length; here we found good iron ore in inexhaustible quantities. These islands are mostly capped with iron ore, to a great extent broken up, washed clean and lying ready for shipment. There are millions of tons of it. It consists principally of manganiferous carbonate of iron, valuable for the manufacture of Bessemer steel.

Q. What percentage of iron to the ore?—About 50 per cent. of carbonate of iron and about 25 per cent. of carbonate of manganese, and it is much richer than the ordinary iron ores in England. Then there is also lead ore there—a band of rock from 20 to 30 feet in thickness, which is rich in galena, has been mined to a small extent at one place. While I was there, I was able to point out better places than where they had been mining. Anthracite coal is also found on one of the islands, not, apparently, in very great quantities, but the quality is very good. We also found traces of gold, silver, molybdenum, copper, &c.

Q. Did you find copper to any great extent?—The chances are that these rocks are very favourable for copper. In the short time at our disposal, we could not wait to make special search for these metals, because we might have found nothing. It is a matter of chance, and we endeavoured rather to trace the rocks themselves. Then on the western shore from Churchill northward, I judge there is a section of country also favourable for minerals. I have there obtained specimens of valuable minerals from the Esquimaux, and specimens of the rock showing the geological nature of the country to the north of the part I explored myself, from the Hudson's Bay Company's officers.

By the Chairman:

Q. Does the frost remain permanently in the ground around Hudson's Bay?—Not that I am aware of. In the northern parts, if any soil exists at all it might be frozen permanently, but in some places where the frost is reported to be permanent, I doubt very much if it is so. At York Factory, a smooth sharpened pole was driven into the ground in many places to a depth of about six feet without finding frost, and the small streams run throughout the winter there, showing that the ground had not frozen, and the water runs out on the banks from under the snow into the rivers. Travellers observe that the banks are frozen sometimes to a depth of 40 feet or more, and jump to the conclusion that

this represents a permanent frost, whereas it is merely a frozen layer lying against the face of the bank. Sir Henry Lefroy has mentioned circumstances in his travels, as seeming to show that the ground was frozen to such great depths, but he has since admitted that probably my explanation was correct, since the radiation of the earth's heat was in two directions in such situations. We find in the latitude of Ottawa City, the ground frozen under similar circumstances. I have seen on the banks of the St. Francis River, Province of Quebec, in digging a hole for a post for a ferry, that there was frost in the ground at a depth of some five feet down. At the mouth of the Nipigon River, in the summer, under exactly similar circumstances, I have also found the same phenomenon in digging a hole, also for a post, in the bank of the river.

Q. You have mentioned in one of your reports that in the summer months you found the water of Hudson's Bay warm enough to bathe in; is this not extraordinary?—We have not only bathed ourselves, but others have done the same; for example, at Churchill, the people of the place go down from the fort, which is four or five miles up the river, and camp out to enjoy the sea bathing in the summer time. As a rule, you cannot tell much about the bathing from what the natives do, because they do not bathe under any circumstances.

Q. Is the coast of the Bay inhabited and frequented by Indians, and if so, describe them?—The west coast is frequented by Indians, as far as Churchill. The west coast Indians are of the Swampy Cree variety; in the Moose Factory region they belong to the Saulteaux branch, while at Churchill, a different tribe of Indians is met with—the Chipewayans, and north of that the Esquimaux; but no Indians.

Q. The north of that country is not inhabited, then?—Yes, by Esquimaux.

By Mr. Paint:

Q. Did you find the natives tractable and friendly, wherever you went?—Oh, yes; the Indians are very well instructed by the missionaries and the Hudson's Bay people; they are intelligent, and all of them can read and write, nearly all of them understanding English. The Indians on the East-main shore are a branch of the Crees, more like the ordinary type in their dialect. At Rupert's House, Indians make their appearance, who come all the way from the Lower St. Lawrence; they also come down from the region of Lake Mistassini, and they are called the Montaignais.

Q. That is an evidence that the waters are navigable? I suppose they came down in small canoes?—Yes.

By the Chairman:

Q. Do you know if the waters of the Hudson's Bay are frequented by other crafts than the Hudson Bay Company's ships? If so, by whom, and what is the nature of their trade?—The waters are frequented by vessels belonging to the Americans, which rendezvous at Marble Island, and carry on business with the natives. They consist principally of small craft, such as schooners and sometimes barques.

Q. So there is a local trade carried on there?—A very considerable trade is carried on at Marble Island. The Americans do not obtain all the oil by killing the oil-producing animals themselves, but by trading with the Esquimaux, goods which they bring with them. I think there are two classes of vessels, the other being the ships which kill the larger whales.

Q. What is the nationality of those ships?—All American. The whalers from Dundee have, I think, come in sailing vessels in former years.

By Mr. Paint:

Q. As far back as a century ago?—Yes.

By the Chairman:

Q. Would you please give an account of what you know of whaling expeditions in the Hudson's Bay?—Whaling began there long ago. The recent report of the American Minister of Fisheries shows that whaling began as early as . The business of the whaling vessels has continued up to the present time.

By Mr. Paint:

Q. But the English were in there before the Americans ever engaged in the

business, were they not?—Yes, long before, but of late years they appear to have left it to the Americans.

Q. Except the Dundee whalers?—Yes. The Esquimaux obtain a large amount of oil from white porpoises, seals, walruses, narwhals and polar bears, and they bring the blubber to the Americans.

By Mr. Foster:

Q. What is your opinion as to the fisheries?—Judging from the latitudes covered by Hudson's Bay, it should be extremely favourable for fish. The water is moderately cold, and the latitude of the Bay is the same as the British Islands and the fishing grounds of Labrador. The sea bottom being favourable for an abundance of food for fishes, we should naturally expect to find haddock and codfish The rock-cod which is found there may be a variety of the common cod, but it is inferior. There is evidence that the ordinary variety of cod is found there; for example, Hearne speaks of having seen the remains of codfish at Churchill. The Bishop of Moosonee told me that while he was at Little Whale River, it was reported that the real codfish had been caught there, and the captain of the ship that I came out with said that he had seen dead haddock floating in Hudson's Strait. According to Richardson, cod are found near Cumberland Inlet, north of Hudson's Strait. The finest fishes of Hudson's Bay that we actually know of are salmon, speckled trout, sea trout, the grayling and whitefish.

Q. Are salmon numerous?—There are three kinds of salmon found in the Bay; only one, namely, Hearne's salmon, is found on the east side. The same is also found at Churchill, and northward on the west side. Further north, the Arctic salmon is said to exist, while the common salmon is abundant on both sides of the Hudson's Strait. The Esquimaux have caught them in large numbers. The Hudson's Bay Company salt them at Fort Chimo, and during the last three years they have been sending them home fresh to the London market. During the last three years cargoes of frozen salmon have been sent by a little steamer called the "Diana," and when they arrive in London are pronounced in perfect condition, and very fine fish indeed. Some have been sent, still frozen, as far as Australia. The whitefish seems to be a very superior fish, and the grayling is found in the streams of the northern part of the west side of the Bay.

By the Chairman:

Q. Have whales not disappeared to a certain extent from the North-West portion of the Bay?—Not that that I am aware of. Of course the whale is a long-lived and intelligent animal, and if they find themselves hunted, they naturaly forsake the grounds. The white porpoise, although not very large, yields the best of oil—yielding as much as a barrel of oil to each one; and one year they got as many as 2,800 of these porpoises at one place.

HOUSE OF COMMONS, OTTAWA, 26th February, 1884.

The Select Committee appointed to take into consideration the question of the navagation of Hudson's Bay, met this morning, Mr. Royal in the chair.

EXAMINATION OF CAPTAIN BOULTON.

J. G. BOULTON, Esq., Staff Commander in the British Navy, and Hydrographical Surveyor to the Dominion Government, was called and examined.

By the Chairman:

Q. What opportunities have you had, Captain Boulton, of becoming acquainted with the Hudson's Bay and surrounding country?—I have been as far as Ungava Bay and Fort Chimo. I went there one summer, in the Hudson's Bay steamer—the vessel that attends to the Hudson's Bay Company's posts on the Newfoundland and Labrador shores. I cannot add very much to what, no doubt, is already known about the navagation of Hudson's Straits. What I would wish to do, would be to offer a few

suggestions, to what I consider the best way to acquire further information, and to establish the duration of the navigable season, which seems to me to be the great object. I should first propose that the Dominion Government would hire a steamer —one of the St. Johns (Newfoundland) steamers, for instance, which are always at hand—and her captain should be one of the St. Johns sailing captains, well experienced in ice navigation—if possible, the captain of the same vessel—and he should have the selection of his crew; and if you want a pilot, the Dominion Government could apply to the Hudson's Bay Company for a man who has been in their service; perhaps one of the mates of the two vessels "Ocean Nymph" and "Prince of Wales," which go to York Factory now, might be lent, if there is no retired man who would be suitable and available for the work. The British Admiralty should also be applied to for a surveyor. In addition to the gentlemen I have enumerated at present, namely, the surveyor, the captain, the pilot and the crew, I think there should be six or seven small parties taken out in the vessel, to be landed at points in the Straits hereinafter mentioned—to be left all winter and picked up in the following spring. These parties should consist of a Canadian gentleman in charge, with some slight knowledge of how to make a local survey and the use of instruments, with a couple of men, one of whom should be an English-speaking Esquimaux, who, I think, could be picked up at York Factory. That would make about twenty altogether in all the parties. The Admiralty surveyor would have charge of the expedition, and would select the localities for the landing parties, and direct the course of the vessel through the Straits, subject to the information of the sailing master in all maters relating to ice, because the gentleman from the Admiralty might not be acquainted with the ice, and, if a surveyor, the chances are he is not. Then there comes the question of coal for the steamer. The distance from St. Johns, Newfoundland, to York Factory and back, is about 4,000 miles, and the vessel would probably burn about 250 tons of coal; therefore it would be necessary to have a vessel large enough to carry that quantity of coal, to take her there and back. I think the vessel should leave St. Johns on the 5th of July, arriving at the Straits about the 12th of July. She should then proceed, under the guidance of the pilot, to York Factory; the surveyor making a running and taking a line of soundings across Hudson's Bay. The vessel might visit Churchill, which probably would be a most suitable place for a terminus—the west harbour of Churchill, as well as York Factory.

By Mr. Dawson:

Q. You have not been so far as Churchill, have you?—No; I have not been there, but I have read of it. It seems to be a good harbour, with plenty of deep water.

To the Committee:

Then I think the officer in charge should endeavour to procure half-a-dozen English-speaking Esquimaux from the Hudson's Bay post at York Factory, one of whom should be landed with each party to act as interpreter, in the event of visits from Northern Esquimaux during their stay on shore. The vessel should then return towards the Straits. Party No. 1 should be landed on Mansfield Island, with material for building a hut, a year's provisions, a small boat, and a few instruments, as may be determined upon hereafter. The vessel should then proceed, and similar parties be landed—one at Cape Wolstenholme, and another on Nottingham Island. The fourth party should be left either on the highest of the Upper Savage Island group or on North Bluff; that is, in the vicinity of North Bay. Another party should be landed in the vicinity of Cape Hope, on the mainland side, just opposite to the position mentioned on North Bay. A couple of parties should also be left—one on Resolution Island, and the other on the northernmost of the Button Islands, so as, between them, to command one of the most important positions in the Straits. With reference to the return of the vessel to St. Johns, running surveys should be made according as the amount of open water and the quantity of coal remaining would permit, and this should be continued until the vessel finally returns to St. Johns, leaving the parties in the Straits. The following summer a similar vessel should be hired again and engaged to pick up the parties landed. I will now speak as to the duties of the parties landed. The principal object of these stationery

parties is that, from their commanding elevation, assisted by a good telescope, the daily condition of the ice, as far as they could see, particularly at the close and opening of navigation, the character of the ice, and the drift and set of the ice, and so on could be ascertained.

By the Chairman:

Q. And also the nature of the currents, their velocity, &c.?—Yes; a man on shore would be able to do that. In addition to this, a record of meteorological phenomena should be kept, the instructions in regard to which might be obtained from one of the observatories of the Dominion before starting.

Q. Have you any personal knowledge yourself of the Hudson's Bay and Strait?—I have never been beyond Ungava Bay and Fort Chimo. I entered the Strait from the Atlantic.

Q. In what capacity?—I was then making a running survey of the Newfoundland Labrador Coast, as far as the vessel, on which I was, went. It was the steamer "Labrador," belonging to the Hudson's Bay Company, which visits several stations on that shore.

Q. You have only been as far as Ungava Bay then?—Yes, and on the Newfoundland Labrador Coast. They have three or four Hudson's Bay posts there, and the steamer goes every summer with provisions, and brings away produce. I made all the surveys I could of that coast, more particularly the Newfoundland Labrador shore, as far as the steamer went.

Q. Was it under Commission from the Crown?—Yes; I was ordered to do it by the Home Government, at the instigation of the Governor of Newfoundland, Sir John Glover.

Q. In what season were you in Ungava Bay?—At the end of August and the beginning of September.

Q You have said that you would suggest that the ship should arrive in the Strait about the 12th of July. Why not sooner?—My reason for suggesting that is that by going at that time she would be sure to get in, and it is very necessary if the scheme is carried out, that she should not have to stay off the Strait and run short of her coal, and perhaps have to go back again, because, as far as the opening of navigation is concerned, that would be better ascertained by the landing parties in the following spring from their stations.

By Mr. Paint:

Q. With regard to the boats furnished these several parties, would you recommend steam launches or rowing whalers?—No; a very small boat would be all that would be required, and that only in case of accident; probably a ship's jolly boat. The parties would only be three in number, and would, therefore, not want a very large boat and, perhaps, would not require it at all, except in case of accident.

By Mr. Dawson:

Q. Were you at the Hudson's Bay post at Ungava Bay?—Yes; they have a post there at Fort Chimo, near the mouth of the Koksoak River.

Q. Of what does their trade at that post chiefly consist? Have they any whale oil?—Yes; they get the oil from the white whale.

Q. Is that white whale the same as our porpoise of the St. Lawrence Gulf?—I do not think it is, but I am certain I never heard of it in the Gulf of St. Lawrence. It is what is called the white whale; some call it the white fish, and some the white porpoise. It is not a very large fish; it is larger than the porpoise, and considerably smaller than the ordinary whale, but very rich in oil.

Q. I believe that codfish are found in Ungava Bay, are they not?—No; I do not think the codfish come inside the Strait at all.

Q. Oh yes, I think they have caught them in the Strait?—From which part?

Q. In the Strait near Ungava Bay?—That was one of the points in which I was naturally interested, and I could not hear of anybody who had ever seen a codfish there. I also heard that there were very few of the capelin, and that is the fish upon which the cod feeds.

Q. But the capelin are very abundant on the west coast of Hudson's Bay? Enormous quantities have been found there?—Yes; and so the codfish might be there and not necessarily in Ungava Bay. None of the men travelling round the post at Fort Chimo had ever seen one, and if they do exist at all, it is entirely unknown to these people, which is not very likely.

Q What sort of fish do they catch in the estuary of the river?—They do not catch any fish, except the salmon or salmon trout, as far as I know.

Q. When you were at Ungava Bay, did you hear anything of the channel which is supposed to exist between Ungava Bay and Hudson's Bay?—I heard nothing of it there. I know the tract you allude to; it is across from Bay of Hope's Advance to Mosquito Inlet.

By the Chairman:

Q. Did you ascertain the temperatue of the water in the Bay?—Yes; the surface temperature of the water, at the end of August, in Ungava Bay, was from 34° to 35° Fahrenheit; warmer, in fact, than it was on the outside coast. The temperature in the Atlantic, on the Newfoundland-Labrador shore, south of Cape Chudleigh and southward, was 32°, about 2° colder than in the Bay.

Q. Are you aware of the rate of insurance on vessels that go into Hudson's Bay?—No.

Q. Do you know anything about the whale fisheries carried on by the American whalers in the Strait or at the head of the Hudson's Bay?—I have read a little about them, how that they come in from New Bedford every year, and also winter in some parts of the Hudson's Bay, I think.

Q. Is the Hudson's Bay or Strait subject to storms?—I think that information could be best obtained from the log books of the Hudson Bay Company's ships.

Q. Would you kindly describe Hudson's Strait, as far as you have seen it?—Cape Chudleigh—that is the northern part of the peninsula between Ungava Bay and the Atlantic—is a high-land, about 1,000 feet high. That is separate from the group of Islands called Button Islands, which are also high. I dare say some of the summits—one I know by estimation is—are quite 1,000 feet high too. The main land is separated from these islands by a channel about four miles broad—a comparatively clear, deep water channel When we went in we kept close to the main land shore all along, and ther was every appearance of deep water. The master of the Hudson's Bay steamer, in which I was, said that he had never seen any sign of shoal. I named the strait after the captain of the vessel—Gray Strait. That is the passage on the south side of the entrance to the Strait, from the Atlantic.

By Mr. Dawson:

Q. The entrance you speak of is on the south side, is it not?—Yes; quite close to the main land, and this group of Islands occupy a space of probably three or four square miles. It is on that group of Islands that I suggested that one of these parties should be landed, because they are high, and I think it would be a very good place to watch that portion of the Strait, in conjunction with the party on Resolution Island.

Q. Was there any ice in the Strait when you went in, or did you see any snow on the high lands you speak of?—We went in towards the end of August—about the 25th—and we saw very little ice; we saw no field ice going across Ungava Bay. From the time we entered the Strait, I think we only saw a couple of small icebergs, practically nothing at all, and the master of the vessel said that it was the normal condition of that part of the Strait at that time of the year. This was the time of the year that he always went in.

By Mr. White:

Q. Do you know at how late a period that normal condition continues?—No; I do not know how late, but of course we came out on the 7th or 8th of September, and it was even clearer than when we went in—in fact, no ice at all, and the master of the vessel told me that he had never been stopped by field ice in entering the eastern part of Hudson's Strait, or leaving at the same time of year—going in at the end of August and coming out about a fortnight afterwards, in the beginning of September. He said he had not, during his twelve years' experience, been stopped by field ice.

Q. But you do not know how it was in October or in the early part of November?—No.

By Mr. Dawson:

Q. And there was no snow visible in the country when you were there, I suppose?—No; scarcely any in the middle of August.

Q. Was there any vegetation about the Straits, or trees growing of any kind, or the country covered with scrubs or small bushes?—There is a few bushes in the gulches, that is all.

Q. But the rocks are bare, are they not?—Not altogether bare; they are covered with moss, I think. There were stunted juniper trees at Fort Chimo, at the bottom of Ungava Bay, but generally the country is rocky, partially covered with moss.

By Mr. White:

Q. You are of opinion that there would be no difficulty about getting in at the 12th of July?—No; I should think not, in an ordinary season. Sailing vessels have been delayed to later than that. Some of the Hudson Bay Company's ships have been delayed until the end of July. I think, as a rule, they generally get in about the 20th of July, but of course a steamer would get in earlier.

By Mr. Paint:

Q. I suppose there would be nothing amiss if the steamer were sent there with a sailing ship, with a cargo of coal. It might assist the steamer and enable her to do work more efficiently. Do you not think so?—Yes; that might be done. In that case the sailing ship had better go with the steamer so as to rendezvous at the same place.

By Mr. Dawson:

Q. There is said to be plenty of coal in the Bay itself, towards the end of Fox Channel. You have heard of that I suppose?—No; but I have heard of coal being found north—I do not know the exact locality—by some Arctic expeditions, in the vicinity of Hudson's Bay.

By Mr. Watson:

Q. Do you not think it would be better for this vessel to cruise round the Strait during the fall and move out early in the spring?—I do not see the advantage of a vessel freezing up there. It would be so much additional expense to the Government—the expense of the crew, and so on—and I think, so far as the opening of navigation is concerned, it could be best ascertained by the parties on shore.

Q. It is claimed by some of the Hudson's Bay people that the Strait is open in winter as well as in summer?—Yes; that is my reason for stationing the parties in the positions which I have mentioned. Each party would be able to command, with the aid of a telescope, a view of the whole distance. The land is fortunately very high, and the two parties stationed opposite each other would, on a commanding elevation, be able to judge, beyond the shadow of a doubt, as to whether the Strait is regularly frozen across in the winter or not.

By Mr. Paint:

Q. How many days steaming would it be from St. Johns, Newfoundland, to the Straits?—The distance from St. Johns to York Factory and back is about 4,000 miles. If unimpeded by ice, she would be able to do 100 miles per day, making the voyage there in about twenty days. But of course she might be stopped by ice.

Q. The distance from Churchill to Liverpool is reported to be what?—A little short of 3,000 miles, I think. Of course the vessel would not only need to carry coal enough for the voyage from St. Johns to York Factory, a distance of 2,000 miles, but would have to take enough coal with her to bring her back, if she could not get any coal in Hudson's Bay.

By Mr. White:

Q. She would require forty days at least, I understand you to say?—I think she would require quite 250 tons. These Newfoundland vessels can store 300 tons.

By Mr. Paint:

Q. What is their consumption per day?—I fancy they could steam about 200 miles with about ten tons of coal.

By Mr. Dawson:

Q. They say that the tides rise 30 feet in the Hudson's Bay. Do you know anything about the rise and fall of the tides there?—I ascertained by my own observation, that the spring tide rose 38 feet at the bottom of Ungava Bay, and Captain Parry, with the best means at his disposal, considered that the spring rise of the tides at the Upper Savage Islands, about the middle of the Strait, was 25 feet, so that I think the average would be about 30 feet.

EXAMINATION OF DR. BELL. *Concluded.*

ROBERT BELL, Esq., LL.D., M.D., Senior Assistant Director of the Geological and Natural History Survey of Canada, was again called before the Committee, and his examination resumed and concluded.

The Chairman requested the witness to explain the illustrations on the wall which had been referred to at the previous meeting. Dr. Bell first referred to the diagram representing Cape Wolstenholme, at the angle between the south side of the Strait and the east side of the Bay, which he described as the most northern point to be rounded by the ships passing out of Hudson's Bay. The coast was here represented as bold, the rocks rising nearly perpendicularly to a height of between 1,000 and 2,000 feet, and resembling some of the more prominent cliffs on the Saguenay. The diagram represented them as viewed at a distance of about 10 miles. The next view represented the East Main coast in the neighbourhood of Little Whale River. It showed a picturesque coast, with high hills, whose steep sides faced inland, while the strata forming the hills sloped at a moderate angle into the sea. The clumps of woods shown in this view consisted of spruce and tamarac, of pretty fair size. The third view represented the mouth of the Little Whale River, with the Hudson Bay Company's establishment in the foreground, and a high cliff, like that of Thunder Cape, on the opposite side of the stream.

By Mr. White:

Q. Is there any vegetation there?—Yes. The spruce trees, although the trunks are a pretty good size, are not tall, and the branches go down nearly to the ground.

By Mr. Watson:

There are also grasses there, I understand?—Oh, yes; there are grasses, sedges, and a variety of vegetation. Potatoes have also been grown, but only as an experiment. A variety of plants used for salad grow well there. I also saw the rhubarb plant in a little garden at this post.

Dr. BELL, continuing said:—The fourth illustration was a view of the entrance to Richmond Gulf, taken in the depth of winter by James L. Cotter, Esq., who was a good photographer, and brought his apparatus from Little Whale River, a few miles to the southward. It showed the open water with an Esquimaux paddling in his kyak, while the hills were partly covered with snow. The fifth view represented Castle Peninsula, a remarkable point inside of Richmond Gulf. The maps represented surveys which had been made by the witness of the basin of Moose River, Lake Winnipeg, and the boat route thence to York Factory, the Nelson River; also Hudson's Bay, from the chart. Another map showed the relative positions of North America and Europe, including the so-called Hudson's Bay route. There was also a large circum-polar map, to show the position of Hudson's Bay with regard to the North Pole, and the Equator. Hudson's Bay was approximately midway between the North Pole and the Equator, rather than in the Arctic regions. This map also represented the position of icebergs and iceflows, shewing that only a small isolated stream of bergs comes down Fox Channel, but none at all enter Hudson's Bay. The great stream of ice referred to by Capt. Boulton, was here represented as coming down from Davis Straits and the coast of Greenland. Another of the pictures shown was an artistic representation of the musk ox, standing on the barren grounds, drawn by Mr. Lambe, from a photograph in the possession of the witness. They are numerous in the country north-west of Hudson's Bay, and range down the west side of the Bay towards Churchill.

By Mr. Dawson:

Q. What would be the weight of a full-grown ox?—It would not be very great, probably not more than 500 or 600 pounds.

By Mr. White:

Q. Is there any vegetation there for them to live upon?—Yes; they range over the barren grounds, which is the country north of the limit of timber, excepting the part of these grounds south of Hudson's Strait.

By Mr. Dawson:

Q. Is the musk ox found as far south as Richmond Gulf?—It is not found on the east side of Hudson's Bay, but ranges as far north as any Arctic travellers have gone.

Q. Has it not been found on the south side of Hudson's Strait?—It is not found on the south side, but is common on the north side. The animal I referred to on the south side was the barren ground cariboo.

By Mr. Watson:

Q. What is the fur of the musk ox like?—It is of the same colour as the buffalo, but a much deeper fur with long outside hair. It is used much more now than formerly, on account of the growing scarcity of the buffalo. It is greatly used for sleigh robes.

By the Chairman.

Q. What is the meat like?—It has the flavour of musk, but the natives eat it.

Q. Are you aware of any trade carried on in ivory about Hudson's Bay?—There is a small trade in ivory, derived from the tusks of the walrus and the so-called horn of the narwhal. I have also heard stories, more or less vague, of elephant's tusks having been found somewhere about the Bay. It is well known that large quantities of ivory are derived from the tusks of elephants which had lived in Siberia in post-tertiary times. We also know of similar tusks of extinct elephants in Alaska and the lower Mackenzie River country, and it is possible that similar tusks may be found about Hudson's Bay, especially as I have myself obtained teeth of both the mastadon and mammoth in that region. I submitted photographs of the latter to Prof. Boyd Dawkins and other naturalists, who pronounced them the same species as the common mammoth of America and probable identical with one of the living elephants.

Q. Supposing that the Canadian Government resolved to send a steamer to Hudson's Bay for the purpose of increasing our knowledge of that region, what matters would you consider should be attended to by the party in charge?—Well, there are so many things that could be done which would be of great value, that it is hard to say what would be the most important. I will begin by speaking of the approximate surveys which might be made, and which would certainly greatly improve the charts now in existence and solve some of the problems already referred to by members of the Committee, such as the supposed channel between Bay of Hope's Advance, and Mosquito Bay. A track-survey might be made of both sides of Hudson's Strait; the astronomical positions of the more prominent headlands, which might have reference to the navigation of the Bay might be obtained; the positions of the more important groups of islands should be determined; soundings might be taken everywhere; the rise and fall of the tide and the time of high water at full and change should be ascertained, all of which would benefit navigation very much. The positions and nature of harbours of refuge should also be determined and the most desirable points at which to place beacons or light-houses. So much for geographical data. Then, as to the question of the fisheries; it is extremely important to ascertain whether or not cod and other valuable food fishes exist. In the meantime, we may perhaps obtain some additional information in regard to the fishes of Hudson's Strait from the Smithtonian Institution of Washington, which more than a year ago sent out an agent to reside at Ungava Bay. Last winter I wrote to Professor Baird on this subject, and he kindly promised to give us full particulars as soon as their agent made his report. I have again lately written to him for the promised information.

Q I suppose meteorological observations might be taken too?—Yes; meteorological observations of all sorts, and magnetic observations might be taken, which would be of very great interest indeed. The magnetic pole lies at no very great

distance northward of Hudson's Bay, and observations in regard to the dip and variation of the compass and other magnetic phenomena would be both valuable and useful. Observations in regard to the *aurora borealis*, which is a conspicuous phenomenon in this region, might also prove highly interesting. But to my way of thinking, the geological part would be one of the most important. A vessel crusing around Hudson's Bay would afford such splendid opportunities of visiting widely separated localities, as well as the islands otherwise inaccessible, that we might accomplish as much in one year as would be possible in many years in our usual way. Many of the problems in regard to the rock formations and the economic minerals of this extensive region could thus be easily solved. It would also give us an opportunity of bringing home large geological and mineralogical collections, which would be impossible where specimens have to be carried on men's backs or in canoes, but if we had a ship alongside we could transfer them to it at once. I do not think that an hour would pass that something could not be recorded which would afterwards turn out to be valuable. It appears to be a perfect mine of information, waiting to be explored.

Q. In view of all these circumstances, should not the Imperial Government aid in the undertaking?—Well we might think they should, but I doubt very much if they will. It seems to me that they would think that it is rather an inland water of Canada. We might ask them, but they might fairly refuse, and we would have to rely on our own resources. Then, in regard to natural history specimens, a taxidermist on board could not only have leisure and convenience for skinning and preserving the specimens in natural history, but they could be brought home better than by any other mode. Botanical specimens of all sorts could also be collected and preserved.

Q. How long would such an expedition remain there?—Any expedition at all would be better than none, even though it should only remain a single season; but it would be still better if it could remain out two seasons. Some such plan as Captain Boulton suggested might be adopted.

Q. That is, distributing parties on both sides of the Strait, and leaving them there during the whole winter?—Yes; and after the vessel had left the parties at their respective stations, she should cruise round the Bay in pursuit of the information I have spoken of. We might make some interesting discoveries there.

Q. What kind of vessel would be most suitable?—I should think one of the best class of Newfoundland sealers would be the most suitable. I have been in Newfoundland on several occasions, and have had opportunities of inspecting this class of vessels, as well as their mode of operation, and I think they would be extremely well suited for the purpose; in fact, more so than any other class of vessels.

By Mr. Paint:

Q. They are built for that purpose?—Yes; and by husbanding the coal, you might save enough on the journey there and back to enable you to spend considerable time in taking observations in the Strait and elsewhere.

By the Chairman:

Q. They are small whalers, are they not?—Yes; they are auxiliary steamers, and can sail as well as steam.

Q. Have you a list of the arrivals and departures of the Hudson's Bay Company's ships at York Factory, Moose Factory and Churchill?—The lists were published in my report in 1880; it was obtained from Mr. Armit, Secretary, and Mr. Fortescue, Chief Factor of the Hudson's Bay Company. The list is complete up to 1880. In regard to the length of the season, I am reminded of a case that is mentioned by Mr. Horetzky. In 1875, the barque "Prince of Wales" sailed from Moose Factory on the 13th of October, and after considerable delay, through damaging her rudder in Hudson's Bay, she arrived safely in London after a twenty-nine days run. In 1864, after the "Prince of Wales" and "Prince Arthur" had got on shore on Mansfield Island, the former reached York Factory late in the season, and the schooner "Martin" was afterwards despatched to Moose Factory, where she arrived at the end of October. I heard of these things from gentlemen who were concerned in the voyage.

Q Is there anything which you would like to add in regard to the information you gave us the other day about coal and other matters?—In regard to coal, I may say that, in addition to the anthracite which I mentioned the other day as being found on the east coast of Hudson's Bay, the coal about which Mr. Dawson asked a question is found in the neighbourhood of Cumberland Inlet, near to Hudson's Strait. On the opposite side of Davis Strait, at Disco in Greenland coal has been mined at various times. It is of newer geological age than the carboniferous period. Coal of the latter period is, however, found in several of the northern islands of the Dominion. These are represented on a geological map by Professor Houghton, in McClintock's voyages.

By Mr. Paint:

Q. Do you remember in what latitude Captain Nares discovered coal?—About 82½ degrees.

To the Committee:

Lignite is found on some of the branches of the Moose River, and also on the Albany River, so that you will observe we have a good deal of coal in various directions around Hudson's Bay. In regard to fuel, I may add that driftwood is found in abundance on all the shores and islands of Hudson's Bay, excepting land-locked bays and inlets; and still further north, the Arctic explorers tell us driftwood is found. This driftwood comes out of the rivers of more southern latitudes. Referring to temperature, on the voyage from York Factory in 1880, I took the temperature of the water frequently by having a bucketful hauled on deck, and it was found, as soon as we came under the influence of the ocean currents, the temperature fell very much, as compared with that which I had observed near the land within Hudson's Bay. Ungava Bay, referred to by Captain Boulton, is subject to the Arctic stream which passes down the Labrador coast, so that far to the south the temperature of the water is near the freezing point.

By the Chairman:

Q. But in your opinion, do you not think that this cold temperature of the waters would be a great factor in carrying the meat from the North-West to Europe?.—It is very important that the temperature should not only be low, but also uniform. The water in the northern part of the Bay is probably about 40 degrees at the end of September, when I was passing out. During the greater part of the voyage there the waters were of an average low temperature.

By Mr. Dawson:

Q. You found the summer temperature near the shore to be 53° Fahrenheit, did you not?—That was only near the shore, and we were enabled to ascertain it as we were coasting in a small boat. It is an important fact that it is so, as probably hereafter these shores will be frequented for sea-bathing and summer travel from the south.

By the Chairman:

Q. Is there any difference as to the time of the opening of the Nelson and Churchill Rivers?—Yes; I think the Nelson River is open somewhat longer—indeed it is open late in the fall and early again in the spring, and some winters it does not freeze at all for 40 or 50 miles up. The reason for this may be owing to the fact that it proceeds from the heated waters of the lakes of the Winnipeg Basin, whereas the Churchill comes from no great lakes. It is a clear, bright, cold water river, like the St. Lawrence, whereas the Nelson River is muddy, like the Saskatchewan River.

By Mr. Watson:

Q. What is the depth of the water in the Nelson River?—I sounded it continuously, between the last rapid and the head of tide, and found the average depth 20 feet and upwards; we were pretty certain that there was no place shallower than 20 feet.

Q. It is navigable for 20 miles up, I believe?—It is 20 miles from the open sea to the head of tide, but the river is navigable for about 50 miles above the head of tide. In the estuary, much of the bottom is dry at low tide, and consists of mud flats covered with boulders, with its channel in the centre having two fathoms or more

of water. Three engineers, Messrs. Jukes, McNichol and Matheson, who have examined this estuary since I was there, found it deeper, if anything, than I had done, in many places.

By Mr. Paint:

Q. I think you said that the Nelson River was under a mile wide?—Yes; at the head of tide water it is under a mile, and higher up still less. While on the subject of the rivers of Hudson's Bay, I may state that this Bay, being the centre of one of the largest of the drainage basins of North America, excepting perhaps that of the Mississippi, receives a considerable number of rivers. I know of about thirty or more important rivers, besides innumerable smaller streams, which flow into it. As a rule, however, they are not very deep, or navigable to any great distance from the sea. On the west side, the longest stretch of navigation is, perhaps, to be found on the Albany, extending some 250 miles from the sea.

Q. Did you visit that river?—Yes. I surveyed a great part of it.

By the Chairman:

Q. Is this 250 miles continuous?—Yes.

Q. What is the depth of water at say 200 miles?—I found it to be about 11 feet during an average stage of water; it has been lower. I know that when Mr. Borron ascended the river, in 1881, he found it very low. I passed downwards at about a medium stage of water.

Q. What is the velocity of the current?—About the same as in the Nelson River, from 2½ to 3½ miles an hour. I have found a rough rule to determine the relation of the velocity to the fall, in rivers of this class, each foot of fall corresponding to about 1 mile in velocity, and so on up to 5 or 6 miles an hour. The other rivers on the west side are also navigable for a considerable distance. For instance, the Moose River and some of its western branches are navigable for upwards of 100 miles, and the Hayes, Steel and Hill Rivers, which are a continuation of the same stream, would be navigable for more than a 100 miles. The Nelson River is navigable for probably 50 or 60 miles from the head of tide, and perhaps even steamships could go up, if they could only pass the bar at the head of tide, the same as they go up the St. Lawrence to Montreal; and the Severn is also navigable for a considerable distance. The Churchill River is not navigable above tide water; it becomes rapid and shallow about 8 miles from the sea. On the east side, none of the rivers are navigable to any great extent. The Big or Fort George River (called by the Indians the Ancient River) which has a course of some 500 miles, is only navigable for a distance of 20 or 30 miles from the sea. The others are only navigable for still shorter distances. Some of them have beautiful waterfalls very close to the sea, and in the case of one, the Langlands River, the fall is something like that of theMontmorenci River, below Quebec.

By Mr. Dawson:

Q. Is it as high as the Falls of Montmorenci?—Not so high. There is only a short distance between the foot of the fall and the sea shore, and the water of the intervening pool would probably be a fine place for salmon.

Q. Are salmon abundant in the Churchill and Nelson Rivers?—Salmon are not found at all in the Nelson River, but sea trout and salmon are abundant in the Churchill River—the Nelson being apparently too muddy—it is Hearne's or the spotted salmon.

Q. You have spoken of the lignite on the Moose and Albany Rivers. How would it compare with the Saskatchewan coal? Is it of the same character?—It is of the same character as the poorer class of Saskatchewan coal, but it is not even so old, geologically, as that. It belongs to the post-tertiary or drift period.

Q. But still it might improve in depth? There might be better coal below the surface?—Yes, perhaps a little better, but its general character would not alter much below the surface, and even though it were of better quality than it is, there would be no use for it, as wood is abundant in both the regions you have referred to.

Q. What is the character of the wood? Is it valuable for commercial purposes? Is there not good spruce and pine on the Moose River?—There is a great deal of fine white and red pine there, and also much spruce, tamarac and jack or banksian pine. On the upper waters of the Albany are also found spruce, tamarac and this same jack or banksian pine. In many sections, especially in the lower parts of the Moose River basin, the coniferous timber has been extensively burnt off, and a second growth has sprung up, consisting of white birch, poplar, and so on. It must have been about 100 years ago, as the old Indians tell us, that it looked about the same as now as long ago as they can recollect.

Q. The climate is not unfavourable for the growth of certain cereals and vegetables in James Bay, is it not? I think you mentioned in one of your reports that you saw the tobacco and other delicate plants growing in September?—On the 1st day of October 1877, when I left Moose Factory, the tobacco plant, the castor-oil bean, the cucumber and balsam and other delicate plants were still green and quite untouched by frost. I was aware that they had been started in the house, or under glass, but the fact that they were still green, standing in the open air, showed that there had been no frost up to that date.

By Mr. White:

Q. At what period was that?—The 1st day of October, and I believe they remained green for long after that date, as we did not experience any cold while ascending the river. It may be different in other years; the climate seems to vary there as elsewhere from one period to another. There was a long period of favourable seasons, from 1874 to 1879, and in these years no ice was reported in the Strait, as a general thing, by sea captains going in or coming out.

By Mr. Dawson:

Q. How far north along the Bay does the climate admit of the cultivation of garden vegetables?—I have mentioned a little garden on Little Whale River on the east coast. On the west coast, potatoes, turnips and vegetables used for salad are cultivated as far north as Churchill. At York Factory they have better gardens, but the influence of the immediate proximity of the sea is unfavourable at all these places. In former years better gardens were cultivated a short distance inland from York Factory.

By Mr. Paint:

Q. What latitude is that?—57° 1'.

By Mr. Dawson:

Q. Along the immense extent of country between the mouth of the Moose River and York Factory, sloping towards the sea, is there not valuable timber?—Yes, I should think there must be. At the different Hudson's Bay posts in this section logs are supplied to employ the men sawing boards during the winter. The logs are chiefly spruce. The region you referred to is not too cold for this timber to attain a large size. Moose Factory is some 15 miles south of London in latitude, and the great region south of it again would correspond to the southern parts of England and the northern parts of France. The region in question is far enough inland not to be affected unfavourably by the cold Atlantic current, while at the same time it may not participate in the causes which modify so favourably the climate to the west. It is about the average for its latitude.

By Mr. Paint:

Q. Do you remember the diameter of this timber?—From 1 to 1½ feet on an average. There were some larger logs than that, probably upwards of 2 feet, but the average would be from 1 to 1½ feet.

By Mr. Dawson:

Q. But on the Moose River, towards Abittibi Lake, it is reported that timber 3 feet in diameter has been found?—On the head waters of the Mattagami and Abittibi Rivers, white pine trees are found, girthing 8 feet near the butt. These are the largest trees.

Q. They grow wheat between the watershed and New Brunswick House, do they not?—There is some fine farming land at New Brunswick House, but wheat was not being cultivated when I was there.

Q. But it has been grown?—It has been grown in former years. Mr. McIntyre informed me that while he was in charge of that post, he grew wheat. The farm is now in the hands of a former servant of the Hudson's Bay Company, who lives by cultivating the ground and raising stock.

Q. There are occasional areas of very good land along the Moose River, before you get very low down, are there not?—I would not say occasional areas, but rather that the land appears to be good generally between the watershed and the low lands you referred to. Much of it is covered with moss, as is usual in such latitudes, where the coniferous trees shade the ground and prevent the snow from thawing until late in the spring, but when such trees are destroyed by fire white birch and poplar take their place.

Q. You think it would be susceptible to cultivation, then?—Yes.

Q. The area, taking it altogether, is very large?—Yes; very large indeed. It would be a large agricultural region.

Q. Many hundreds of square miles?—Yes; many thousands of square miles.

By the Chairman:

Q. Do you know whether amber has been discovered anywhere in these regions?—In the lignites, there are small quantities of a mineral of an identical nature, but of no practical value.

Q. What reliance do you place on a ship's log-books for judging of the question of navigation involved in the discussions of this Committee?—The statements in these log-books are of course correct. I have every confidence in the statements in the log-books of the whaling captains as well those of the Hudson's Bay Company, but when read by a person other than the one who kept them, they would not give you a correct impression of the state of matters. All the common-place or every day occurrences are omitted, and these make up a great part of the voyage. The effect of putting all the extraordinary occurrences together, gives an exaggerated account of the difficulties.

Q. It certainly may not look favourable?—Long periods, when everything is going well are not noted.

By Mr. White:

Q. It is the exceptional difficulties which are given. We may assume that all is going well when nothing to the contrary is stated, and therefor it is the more valuable, is it not?—Yes. For example, some time might pass without any entry being made. Whilst storms and ice and cold may be all mentioned, no entry may be made of calms and fine weather. Referring to the winter notes of whalers, frozen in in the northern parts of Hudson's Bay, I may say that we need not be alarmed on account of the low temperatures recorded, for at the same time that the cold is not as great as that of Minnesota or Dakota, it has nothing at all to do with the navigability of the Bay in the summer. A few years ago, during a severe winter in the Northern States I had letters from the Hudson's Strait posts all the way up to the most northern one, and they showed that the temperature improved in going north, and it was much higher on the shores of Hudson's Bay than in Minnesota.

The CHAIRMAN—On Christmas Day, 1879, the thermometer registered 62° below zero at Fort Pembina, while—I was at Manitoba at the time—35 or 40 miles north of that, the thermometer only registered 58°.

Mr. WATSON—I believe the coldest weather they had last year on the Nelson River, in the month of January and February, was 52° below zero.

Witness (continuing)—At the place referred to by Mr. Watson, the coldest winds come from the southward, while those from the sea are less extreme, although they may be raw and disagreeable.

By Mr. Dawson:

Q. Please give some of the opinions you have quoted from whaling captains, based on their own log-books?—They are all favourable, with the exception of that

of Capt. Spicer, who appears to have spoken from interested motives. He has a trading station near the Upper Savage Islands, inHudson's Strait,where he is understood to do a good business in the produce of the country. The general opinions of all the others were more favourable than one would form for himself, judging only by the statements recorded in their logs. These opinions and logs were obtained through Capt. J. L. Briggs, of Brooklyn, Long Island, at the expense of Mr. Erastus Wiman, of New York, and were kindly furnished by Mr. Wiman to the Government, at my request. Capt. Jacob Tabor, of New Bedford, who made two voyages to Hudson's Bay, in 1862 and 1863, remarks:—"The entrance to the Bay can be made from the 1st to the 15th of July. Steamers would have great advantages over sailing vessels, as they could steam inside of all obstructions from ice, water being bold close in shore; tides, strong, say 6 to 7 miles, but quite regular. No trouble about coming out up to 1st November, and some seasons, later." The evidence obtained from other sources is in favour of the opinion that the Bay and Strait may be navigated much later. Capt. Tabor continues: "Nearly all the danger from ice at that time would be outside Resolution Island. The ice comes down from the north, and sometimes grounds to the south, and there piles up to the north, until it closes in the mouth of the Straits." This piling up means an accumulation of the ice on the surface of the water, in the direction from which it has come. Mr. Crawford, formerly of Brockville, has told me that he observed the same phenomenon. He informed me that on a voyage from St. John's to Hudson's Straits, he kept outside of this accumulation of ice, which was pressing against the Labrador and Newfoundland coasts. Capt. Tabor concludes: "Hudson's Bay is open all winter, and what little ice makes on the shore breaks up with every gale of wind. About 30 feet rise and fall of the tide (in the Strait and northern part of the Bay), and the currents are swift." Capt. St. Clair, of the ship "A. Horton," of New Bedford, remarks: "June 17th, 1877, entered into the Bay. Came out, September 15th to 25th, 1878." Capt. St. Clair had lost all his memoranda and log-books, but was of the opinion that a steamer could go in by July 1st, and come out as late as in 1878, in which year the ice did not make its appearance until November 12th. Capt. Elnathan B. Fisher, who made eight voyages to Hudson's Bay, covering some sixteen years, says: "A steamship can enter and go through the Straits some ten days sooner than a sailing vessel, say by 1st July, and might some seasons sooner. Whalemen never had any trouble in coming out, as they leave as soon as the summer whaling is over, and are always out by November 1st. Ships do come from Cumberland Inlet later than that, and it is somewhat further north. The only trouble is in Hudson's Strait, and that is caused by the ice coming down from Fox Channel, and lodging among the Islands in the Strait, blocking up the narrowest part, which is about midway of its length. A steamer could 'crawl' out, by keeping close to the rocks inside of the ice, as there is always open water, more or less, between the rocks and the great body of ice. The tide runs 6 or 7 miles an hour, and at every turn of the same, more or less breaking up occurs, and a steamer could take advantage of all such chances, where a sailing vessel would be at a standstill, if the wind was ahead, and blew any way fresh. The Bay is open all winter, except a little ice that makes near the shore, and that breaks up in every gale of wind. It was never very cold where they wintered, in a small harbour to the north-west." Capt. E. White, who made two voyages into Hudson's Bay, and one to Cumberland Inlet, and a very intelligent man on ice navigation, remarks: "On first voyage, entered the Bay on August 1st, 1882, and put away for home about September 10th. Found so much ice that the captain was frightened, and put back and wintered." Capt. White thinks there is no doubt but that they could have come out if they had been conversant with the Bay and Strait.

By Mr White:

Q. Is there not one or two of the Hudson's Bay ships which have entered this winter, and which have been unable to get out?—Yes; the "Ocean Nymph" is now wintering at Churchill.

Q. That was because she could not get out?—Yes.

Q. In what month did she attempt to get out?—It would be some time in October; at the same time, if she had been a steam vessel, she might have passed out easily enough.

By Mr. Dawson:

Q. I see one of the captains speaks about the drifting of the ice sometime in July and August?—I see that the captain says: "On second voyage, July 4th, 1864, sighted Resolution Island; August 1st the ship was inside, but became somewhat damaged by the ice. A sailing ship has got a poor chance going in or out; with a good strong steamer one could enter the Bay sure every year from July 1st to 10th; and he thinks she could count on three months sure of such navigation, that she could pass in and out." What I have just read is Capitain Brigg's report to Mr. Wiman.

By Mr. White:

Q. Would you require to have ships specially constructed for the navigation of Hudson's Bay?—I think not. If we could not avail ourselves of the ships floating to-day—say 6,000 ton ships—the whole question is at an end. A profitable trade could not be done.

Q. The commercial question would come in there?—Yes; as to the rates of large ships compared with small ones. I do not think the ships would be damaged by the ice, as a rule.

Mr PAINT.—The Allan ships have been occasionally damaged by the ice in the Gulf of St. Lawrence. I recollect one winter not long ago that when the "Hibernian" entered the harbour of Halifax, she was covered with ice and hundreds of people standing on the shores witnessed her attempts to force her way through it; she ran into it, backed, ran in again, with a full head of steam, and did this repeatedly until she effected an entrance. It was feared that she would damage herself, but she did not do so.

Mr. WHITE.—Two or three years ago one of the Allan steamers, the "Peruvian," I think, was between two and three weeks in floating ice at the entrance to the Gulf of St. Lawrence, and came out unharmed.

WITNESS.—Two years ago the newspapers were full of the difficulties of getting into the St. Lawrence on account of floating ice, till well on in summer.

HOUSE OF COMMONS, OTTAWA, 4th March, 1884.

The select Committee appointed to take into consideration the question of the Navigation of the Hudson's Bay, met this morning, Mr. Royal in the chair.

EXAMINATION OF MALCOLM McLEOD, ESQ.

MALCOLM MCLEOD, Esq., Barrister, of Aylmer, P. Q., was called and examined.

By the Chairman.:

Q. Have you any, and if so, what personal knowledge of navigation in Hudson's Bay and Strait?—To answer this question merely in a general way, I would state that I was born on the Churchill, and that in 1830, with my father, John McLeod, sen., Chief Trader to the Hudson's Bay Company, I started from York Factory about the 10th of September, in the ship "Prince Rupert," arriving in London about the 22nd October. There was nothing remarkable in the voyage, but I remember some of the features of the Strait. The voyage was a comparatively easy one; we saw no ice in the Bay or Strait, and only two or three ice-bergs in the ocean. That is the only personal experience I have had of the navigation of the Bay and Strait. I was then comparatively young, being only nine years of age, but my recollection of the voyage is very clear and distinct.

Q. Have you had any experience in the navigation of Arctic or northern waters, marine or inland, about Hudson's Bay or Strait, and if so, state with what conclusions, as to their availability for general commerce? or From the facts known to me personally, but principally from the facts which I have gathered from my father's

journal, as to the navigation in question, and more particularly from the numerous letters which he had received during a long course of years from friends in charge of the principal posts of the Hudson's Bay Company, at York Factory, Moose Factory, Rupert's House, and one or two posts on the East Main coast, I have arrived at this conclusion—that the northern part of Hudson's Bay, say from Fort Churchill, may be open for general navigation for four months, or perhaps even four and a-half months; from York Factory, this would probably be shortened by two or three weeks; and from Moose Factory, I would say, the navigation should be open for general purposes about four months. The facts on which these conclusions are based, are to be found in the mass of documentary evidence which I have in my hand, namely journals and papers from the parties I have mentioned, and I am willing to submit them to the Committee for examination, to verify the facts. However, to present the evidence on this subject in a more tangible form, I have taken the trouble to tabulate the time of arrivals and departures of vessels from the posts at York Factory, Moose Factory, and some of the points on the East Main shore, and the special difficulties encountered by them. Some seasons, when there was a prevalence of ice, the vessels were unable to leave. Special reference is made to this in the correspondence with my father, both private and official, but as it would take considerable time to answer fully, verbally, I would respectfully ask the Committee to allow me to give my answers in writing, as it would be much more satisfactory than by answering verbally now.

By Mr. Dawson:

Q. You say your were born on the Churchill River, or in other words, the English River. Do you know anything of the country about there? —The leading facts are these. In 1811, the Selkirk Settlement was initiated. My father was a clerk in the Hudson's Bay service, and with a batch of twelve or thirteen clerks, came out in one of the vessels. I have his journal here, and he writes that they started from Stornaway on the 25th of July, and arrived at York Factory on the 25th September. He calls it a very tedious voyage. The brigades for the interior had returned, the usual time for going to the interior having passed and the season being rather severe, so that they were detained at York Factory, and wintered there. A large party also wintered at Churchill, and with the settlers were agricultural implements. The size of the vessel is not given, but it is described as a ship. Now, it is a fact that no vessel can anchor within from 7 to 15 miles of York Factory, according to the size of the vessel. The "Prince Rupert" is a barque of 350 tons, and her anchorage was from 7 to 10 miles in the offing. Large vessels, such as the "Winchester," of 800 tons, had to anchor 11 miles further off.

By Mr. White:

Q. On account of the shallow water?—Yes; as to this late arrival, the vessel had to discharge the agricultural implements of the settlers. The lighterage must have been very small. The brigades had all gone into the interior, and it must have been the work of ten days, or probably more, so that it must have *been well on in October before the return.* They did return, however, as they did not winter there, and the fact remains that ships have sailed from the north of Hudson's Bay, starting from York Factory, well on in October, and getting home to England. As to Moose Factory, there are several departures as late as the 23rd of September. This information is given by the gentleman in charge at Moose Factory. These vessels all got through, with one exception, and the special reasons of obstruction are given. I have a letter here also from the Chief Factor, James Anderson(*b*), on the North Whale River, on the East Main shore, which states that a vessel sent to that point specially for the products of the fishery—porpoise fishery, probably—left on the *29th September*, and *arrived at Plymouth fifty-three days afterwards*, that is, on the 21st November, and arrived in London a week afterwards, I suppose.

By Mr. Paint:

Q. In what year was that?—In 1861. The letter is dated 1862. In another place, it is stated that in 1836 there was a special brig called the "Eagle" which arrived in York Factory on the 7th of October. She was a special vessel and had to winter

there of course, as she could not leave before the middle of October, and that was too late.

By Mr. White:

Q. So that they do not consider it safe to leave as late as the middle of October?—No; not there, although it might be at Churchilll, where there is a tide of from 12 to 14 feet, but York Factory is some 5 or 6 miles up the Hayes River, and the tide is consequently not so high.

Q. They might leave later on in the season from Churchill, provided there was no difficulty in getting through the Straits?—Yes; because there is a higher tide and more open water there.

Q. Then the question as to whether they can leave Churchill or York Factory does not affect the matter, but it is getting through the Strait, I understand?—Yes; that is the difficulty. As to the Strait, I have a distinct recollection of them. We entered the Strait during the night, and in the morning when I went on deck I remember the first object that struck me. The morning rays were shining brightly over the distant ice-clad heights to the east and south east, and what struck me was the character of the water. It was not like a sea, but it was like a mighty river. There were no waves, but the current was apparently about 5 or 6 miles an hour.

Q. At what season of the year was that?—It would be well on to the middle of September. The Bay is about 600 miles across there. As to the Strait, at that time, there was not a particle of ice; and in Davis Straits there was very little ice. I saw far more ice in the lower latitudes; I must say, however, that according to the accounts here, two years afterwards, the same vessel, the "Prince Rupert," one of the very best of vessels, too, could not get out, but had to winter at Churchill during the winter of 1832-33.

By Mr. Dawson:

Q. At what time did she attempt to get out?—I do not know, but the next season she returned from Churchill to York Factory and sailed in 1833, with the outfit of 1832.

By Mr. White:

Q. The presumption is that she arrived about the same time every year?—Yes.

Q At least within ten days?—Yes; because the whole thing depends upon the internal trade. The brigades must be off at a certain time to reach the higher points of the Mackenzie River. But these other exceptional trips that I speak of, namely, to the North Whale River, and the October trip of the "Eagle," at the time when there were I think certain pensioners sent to the Red River settlement, and the arrivals were very much later than usual.

By Mr Dawson:

Q. That was the time of Colonel Crofton's expedition?—Yes, probably. There is a Mr. Carey mentioned here,

Q. Colonel Crofton was the officer in command of the troops that were sent out, and the pensioners remained in the settlement, I think?—Yes; it is in connection with that movement that troops and their extra stuff were sent there.

By the Chairman:

Q. How many ships do they send out there regularly?—The regular ships were, one for York Factory and one for Moose Factory, but generally there was an extra one sent.

Q. These special ships were sent for the fishery products, were they not?—It would seem that occasionally they chartered ships for the Whale River, and for the products of that post, which consisted almost entirely of porpoise fisheries.

Q. Has the Hudson's Bay Company any other trading post than Fort Chimo, in Ungava Bay?—No; I never heard of any.

Q. Are you aware that the Americans are carrying on, and were carrying on, a trade with the Indians at the post mentioned?—They had no permanent establishment in the Bay. My father was constantly in correspondence with the parties in charge at the principal points of the Bay, and since his death I have kept up the

correspondence with the old friends myself up to 1874, and if there had been anything of the kind, I would have heard it. There may be of late, though.

Q. As a matter of fact, the Americans are carrying on a very productive whale business?—Do you mean north of Churchill?

Q. Yes.—I have never heard of any other on Hudson's Bay.

Q. They must get those products from the Indians or get them from their own men?—From their own men, I think.

By Mr. Paint:

Q. How many years did you reside there?—I was nine years old when I left, and I have not been back since.

Q. While you resided there where did you live?—I lived with my father. His first place was the Red River. He established the first trading posts on the Red River, the Turtle River, at Pembina, at the Forks, (Junction of the Assiniboine and the Red River) Assiniboine River and at Portage La Prairie, and went thence to English River, Isle a la Crosse, and thence to Columbia and New Caledonia Districts.

Q. You were with him then?—I crossed the mountain with him.

By Mr. Dawson:

Q. How old were you then?—Scarcely two, and when I returned scarcely six. He was also at Norway House, where the Company's Chief Officers meet in Council and do their business. I was four years there. At this central situation my father had a very large correspondence from all quarters, private as well as official. Of course my own personal knowledge is very limited, but I may say that the principal facts which I have bearing upon the subject are embodied in these papers.

By the Chairman:

Q. And your evidence is supported by this correspondence?—Yes.

Q. And of course they are all unbiased. That is an important point?—Yes.

By Mr. Dawson:

Q. You say Moose Factory is open for navigation for four months?—Yes.

Q. Not more than that?—So far as I know it is only four months, and possibly four and a-half.

By Mr. Paint:

Q. Do you not think that steamers could prolong the season?—Oh, yes; especially with such appliances as they have now, and with vessels constructed for such navigation as the "Northern Light."

By Mr. Dawson:

Q. Is there not a general feeling that the Bay itself never freezes over, but that it only freezes near the shores?—You have read, of course, the accounts of the different voyages, but it is difficult to arrive at a conclusion. I think most of the accounts of the early voyagers of the Bay are to the effect that the northern part, where the water is deep and there is a constant current and considerable tide, is not frozen over, but the southern part (James Bay) is, on account of its being so shallow. With regard to the tide at Churchill and on the northern coast, there is a tide from 12 to 14, 16, and even 18 feet, whilst in James Bay, at Moose Factory, and in the southern part of the Bay, the average is 4 feet. As to the flow, and whence comes the tide, there seems to be a difference of opinion. The Hudson's Bay people have always considered that it was from the east, and that the ice came from Davis Straits and blocked it up, but this has been contended against, and I find from reading Simpson's observations, in his work with regard to the tides, that he claims that the tide flows from west to east, and that the current flows from Behring's Straits to the Gulf of Bothnia, one of those open waters directly north of Hudson's Bay. His observations were made at Point Barrow eastward all along to the Gulf of Bothnia. My idea is that where there is a strong tide and a good depth of water it is not permanently frozen. The voyagers of the Bay have reported from 60 to 80 and 100 fathoms near the mouths of these openings; further out, of course, it must be more. But the difficulty seems to be that occasionally there is a strong flow of floating ice, which sometimes happens to block up the ordinary ship channels at the

entrance to the Strait. The principal difficulty is between the East Main coast and Mansfield Island. It is a matter of chance whether that channel is closed or not.

By the Chairman:

Q. That is for sailing ships?—Yes, but I do not think all the channels are closed at any season.

By Mr. Paint:

Q. You believe that a steamer might choose her track?—Yes, with a fair knowledge of the waters, currents and tides there, that difficulty could easily be overcome.

EXAMINATION OF MR. PIERCE.

GEORGE S. PIERCE, Esq., Accountant, of Ottawa, was also called and examined.

To the Committee:

During the troubles in the North West, in 1857, the ship "Great Britain," Captain Wilson, was chartered to convey troops by the route of the Hudson's Bay, on their way to the Red River settlement. The vessel sailed from Quebec on the 26th June, 1857, with a detachment of Royal Canadian Rifles on board, namely two companies, for York Factory, comprising 105 privates, 4 corporals, 2 buglars, 15 women and 15 children; Captain Kerr, commanding; Pierce, adjutant; Onion and Armstrong, ensigns, and a surgeon. The vessel had fair weather down the Gulf until getting to Belle Isle Straits; was detained there by adverse winds and fog; met great quantities of ice along the coast of Labrador; entered Hudson's Strait on the 24th July, and thence until her arrival at York Factory the vessel was nearly surrounded with ice and dense fog; sailed through over 600 miles of drift ice, lost false stern, and much copper torn off; arrived at York Factory, August 25th, all well on board, and not one case of sickness on the passage; one male and two female children born on the voyage; sailed from York Factory on the 18th September in company with the ship "Prince of Wales," for London, and "Baroness," for Miramichi; encountered head winds and fogs; got clear of the Bay 28th September; bitter cold weather; thermometer 10 below zero; encountered heavy ice, and beat to West Point, Anticosti; a distance of 2,000 miles was run in ten days; parted company with the "Baroness," of Heath Point, Anticosti, on the 8th October, all well on board; took a pilot on board, on the 10th instant, off Point des Monts, wind from west; towed from Bic Island to Quebec by steamer "Advance," on the evening of the 14th October, and arrived at Quebec on the 16th October, 1857; all well. It may be incidentally mentioned that a vessel formerly arrived at Hudson's Bay for the Hudson's Bay Company from London, laden with merchandise, &c., (I think twice a year) and returned with a cargo of furs, &c. Mr. John McLeod, a chief factor of the Company, embarked on one of the vessels with his two sons, who proceeded to Scotland to complete their education, arriving safe at their destination.

By the Chairman:

Q. Were you on board during that trip?—No; I have gathered that information from other sources. I would merely say that it seems to me to be a real necessity that a railway should be constructed from Winnipeg to Hudson's Bay, for the purpose of conveying the products of that vast country to Europe, receiving in return, either by steamships or sailing vessels, cargoes of merchandise, &c., for that country.

Mr. Dawson—I was myself at Red River when those ships arrived.

By Mr. Riopel:

Q. Are these notes extracts from the log-book?—They are derived from the Quebec Exchange, where the "Great Britain" sailed from and returned to.

By the Chairman:

Q. Was she a sailing vessel?—Yes, a very old sailing ship, and if I am not mistaken she was employed a great many years in the trade between Montreal and London.

HOUSE OF COMMONS, OTTAWA, 6th March, 1884.

The Select Committee, appointed to take into consideration the question of the navigation of the Hudson's Bay, met this morning, Mr. Royal in the chair.

EXAMINATION OF HON. W. J. CHRISTIE.

Hon. W. J. CHRISTIE, late of the North-West Council, and a retired officer of the Hudson's Bay service, of Brockville, Ont., was called and examined.

By the Chairman:

Q. What opportunities have you had of becoming acquainted with the Hudson's Bay and the surrounding country?—By a service of thirty-one years with the Hudson's Bay Company, eight years of which were spent on the coast, four years at York Factory, and four years in charge at Fort Churchill, during which time I made frequent land journeys at all seasons between the two places; also, by sea with schooner and boat voyages along the coast. The rest of the time I spent on the frontier, in the Swan River District, the headquarters of which are at Fort Pelly, where I was for six years, and from there I was transferred to the Saskatchewan District, and after that I was made Chief Inspector for the whole northern department from Fort Garry to Mackenzie River, which position I held for one year and resigned.

Q. State, in particular, what knowledge you have of the navigation of Hudson's Strait?—I have no further knowledge of the navigation of Hudson's Strait, further than that I sailed home through it in September, 1861, in the "Prince of Wales," Captain Herd.

Q. Are you acquainted with the country between Manitoba and the Hudson's Bay, and that between the Great Lakes and James Bay?—Yes; by boat route from Norway House to James Bay; that is from Manitoba to York Factory. I have never travelled the route from Lake Superior to James Bay, but I wintered at Michipicoten, on Lake Superior, in 1842.

Q What is your opinion of the feasibility of building a railway from Winnipeg to Hudson's Bay, or to James' Bay?—I have no doubt a railway could be built from Winnipeg to Hudson's Bay—I should say to Churchill—but I have never been over the country lying between Lake Winnipeg and Hudson's Bay. Whenever I went that way, it was by the river routes. I believe it is a low, flat country, with lakes and swamps, but I have no doubt a railway could be built there.

Q. Would it be difficult to construct a railway from Lake Superior or Lake Huron to James Bay?—I cannot say, as I never passed over that route. I went to Michipicoten in 1842, and I have travelled the boat route from Michipicoten down to Moose Factory, which is the depot of the southern department of the Hudson's Bay service.

Q. Do you consider Hudson's Bay and Hudson's Strait to be open for navigation long enough each year to be utilized for ordinary commerce?—I passed through the Strait only once. I sailed from York Factory in the Hudson's Bay Company's ship, and passed through the Strait. I think the navigation of the Hudson's Bay and Strait is practicable from the middle of July to the end of September. Any later than that would be attended with risks, as the Hudson's Bay vessels have had to turn back and winter in the country, as they could not get through the ice in the Strait. All depends on the quantity of drift ice met on the outward journey. The schooner with the outfit for Churchill generally left York Factory about the 22nd of July, in order to allow of the ground ice being well off the coast to the sea. Dr. Rae, in his coast voyage with boats, in 1846, left York Factory early in June, was detained a good deal by ice, and crawled along the coast between the ice and the shore.

By Mr. Macmaster:

Q. Were you with the expedition?—No; I was stationed at York Factory. My conclusion that the navigation is open about the middle of July is based upon the fact

that the Hudson's Bay Company's ships from London leave the first week in June, and go down to Stromness, and make a point to be at the entrance of the Strait about the middle of July. I should say that the Strait are open from the middle of July to the end of September.

By Mr. Riopel:

Q. In that period, from July to September, are vessels apt to meet with ice?—Yes; they sometimes meet with ice, although not every year, but they always get through. Along the coast ships frequently meet with ice, but they usually get through. I remember that the "Prince of Wales"—of which Captain Herd was in charge, with Captain Bishop (who is now her commander) as first officer, when I sailed home in 1861—was six weeks in the ice last fall, and only got clear of the ice within 100 miles of Moose Factory.

Q. What date was that?—I cannot tell exactly what the date was.

By Mr. Paint:

Q. Was that the voyage out?—Yes; and the other vessel, the "Ocean Nymph," going to the north to Churchill, could not get home, but had to winter at Fort Churchill. The other vessel, the "Prince of Wales," got home, but very late—sometime in November or December. I know it was late, because I shipped goods by her, which were re-shipped to me again, and I only got them in January.

By Mr. Riopel:

Q. According to your judgment, then, even in that period they would meet with difficulties?—The S rait are open then, and you would get throught. In some years you might find no ice, and in other years you might find the Straits blocked up with ice, but the vessels invariably get through some way or another.

By the Chairman:

Q. What advantages, in your opinion, to Canada generally, and to the North-West in particular, would accrue from the opening of the Hudson's Bay route?—The season of navigation is so short that I do not think the route would warrant the cost of a line of railway to Churchill, or to the seaboard. Grain could not be shipped the season of its growth, but would have to lie over one year.

Q. That is to say, from the fall through the winter, to the season of navigation?—Yes; allowing that vessels could remain at Churchill to the end of September—and I do not believe they could remain much longer—I do not think the grain could be threshed and stored ready for shipment by the vessels, and even if it could, they could only make one shipment, as the vessels could not return for a second cargo.

Q. What harbours are there on the west side of Hudson's Bay?—I know of no other harbour than Churchill, which is 200 miles north of York Factory or Fort Nelson.

Q. Are there any good harbours in James' Bay?—There is one, Charlton Island, 60 miles from Moose Factory, out to sea, where the southern ships all go to.

Q. Do harbours exist on the east side of Hudson's Bay proper?—No; not that I know of. There are creeks and rivers that boats can run into for harbour and shelter, but vessels could not go. The coast is low and flat, and the navigation there is very dangerous on account of the shoals. I mean on the west coast of James' Bay, which is east of York Factory. The navigation of James Bay is much more intricate and dangerous than it is at Churchill.

By Mr. Paint:

Q. At 10 miles from the shore, how much water is there?—I do not know.

To the Committee:

The latest that a vessel sailed from York Factory, during the eight years I was there, was the 4th of October. In 1847, I was detailed in charge of the men in unloading the "Westminister." She drew too much water to come over the bar, and they unloaded her outside. She lost one of her anchors, slipped the other, and put out to sea, where she remained for eight days and came back, and she sailed from York Factory on the 4th of October.

By Mr. Dawson:

Q. What was the tonnage of the vessel?—Eight hundred tons. She was lost on her next voyage, going out to the Cape of Good Hope.

By Mr. White:

Q, She was a sailing vessel?—Yes.

By the Chairman:

Q. But do harbours not exist on the east side of the Bay?—I do not know anything about that; I served all my time in the northern department, and then in the interior.

Q. What are the relative positions and characteristics of Churchill, as compared with other ports and routes that might be affected by it?—Churchill is far better than York Factory as a harbour; in fact, there is no harbour at York Factory. I have walked at all seasons of the year between York Factory and Churchill, both in the winter and in the spring. York Factory stands on the point of land between Hayes River and Nelson River, or as we call it, the North River. The Nelson River, at its mouth, is about 25 miles broad, but as you go up the river, it gets narrower, and when you get about 50 miles up, you come to an island called Seal's Island. I remember, in one of our winter journeys, when we came to the North, or Nelson River, we could not get across, so we followed up the river until we came to Seal's Island and crossed there. The river was full of heavy drift ice, which was drifting tremendously, the current being very strong.

By Mr. Paint:

Q. That was in January, was it not?—The end of January, and a very cold winter it was.

Mr. Dawson:

Q. How low does the thermometer fall there?—I have seen them cast a bullet of mercury and fire it through an inch plank, but we never troubled ourselves about, the thermometer after it went below 40 degrees, and the mercury was frozen. I have seen us, when I was inspector for the northern department, go way up the Mackenzie River, and on my way back we left Fort Simpson on the 5th of December travelled with dogs and men from post to post, until we reached Fort Garry and Manitoba, and from there I came to Ottawa on my way home. There were two officers with me when we wintered down there, and we found it 60 degrees below zero. I have felt it very cold down on the Hudson River, but not nearly so cold as on Great Slave Lake.

Q. It is probably not so cold on the Hudson's Bay as down the Mackenzie River, then?—No; this was at Great Slave Lake, south of the Mackenzie River. There was a greater degree of cold there than on the coast.

By the Chairman;

Q. Will you please state whether or not, in your opinion, Hudson's Strait are frozen over during the winter, and if not, your reasons for the supposition?—I do not think that the Strait is frozen over in winter, owing to the strong current, nor yet do I think Hudson's Bay is frozen over, except a certain distance out from shore, as vapor and fog is seen rising from open water beyond the frozen shore ice, both at York and Churchill. The navigation of the Strait is interrupted by the mass of field ice driving down from the north and blocking up the Strait.

By Mr. White:

Q That is the flow of ice in the Strait?—Yes; some years the Company's vessels gets through without seeing any ice at all. On the voyage in which I went home, in 1851, we saw no ice until we came to the southern end of the Strait, and before we reached Cape Resolution, and from there to the "Lizard," we ran across the Atlantic in ten days, having fair wind all the way. If we had not been becalmed in the English Channel, we would have reached the East India Docks, in London within twenty days from the time we left York Factory. That vessel was the "Prince of Wales," and she is still afloat; Captain Herd was her commander at that time, but Captain Bishop is in charge of her now.

By the Chairman:

Q. Are icebergs met with in Hudson's Bay or Hudson's Strait?—Yes; in the Straits. In my voyage, in September, 1861, we met with no ice in the Bay whatever, and we crossed Hudson's Bay, from York Factory to Southampton Island, in three days. We met no ice at all until we came to the southern end of the Strait, a day before we got clear of them altogether; but here we met with several icebergs so large that the vessel hove-to for the night. After we got clear of the Strait, we had fair weather all the way to England.

Q. What is the nature of the ice sometimes found in Hudson's Bay?—Solid pack ice, floated off from shore by high tides.

Q. Have losses and disasters been of frequent occurrence in the Bay or Strait? —Not frequent, and when they did occur it was to chartered vessels not adapted for the voyage, and commanded by inexperienced officers to that navigation, such as the "Graham" and the schooner "Kitty." The "Graham" was a vessel chartered specially for an extra cargo, but when she got into the Strait she came to the pack ice. The last seen of her was when she was going into the ice, where she struck a sharp point of ice and sunk in ten minutes. The crew had just time to save themselves, and they worked their way down to the Moravian Settlement, in Ungava Bay. Some of them perished, I believe, afterwards. The schooner "Kitty" was also lost, but I do not know the particulars.

Q. Are you aware of the rate of insurance on vessels to-day into Hudson's Bay? —No; I have no idea.

Q. Have you seen lists of the dates of the arrivals and departures of Hudson's Bay Company's ships at York Factory and at Moose Factory?—I will tell you my experience of eight years on the coast. Although I was in charge at Churchill, I had to go with the packet. I was at York Factory in the summer time, and I think these are data which you can rely upon generally. The ships for York Factory used to arrive from the 7th to the 15th of August, and depart from the 9th to the 15th of September. The earliest arrival was the "General Palmer," on the 5th of August, 1848, and the latest sailing was the "Westminster," 800 tons, which sailed on the 4th October, 1847. A gale came, and after losing one anchor and slipping the cable of the other, she put out to sea, and it was absent a week, when she returned, and hence the delay of her sailing. She, however, got home safely. The captain of the "General Palmer" was a strange captain, too, and had never been in the Hudson's Straits before. An amusing incident is connected with this trip. Meeting Captain Herd, of the "Prince of Wales," at the East India Docks, in London, the commander of the "General Palmer," who was quite a young man, asked him by which route he was going. "I am going by the old route," immediately replied Captain Herd, in his usual brusque manner, when the commander of the "General Palmer" said, "I intend to go by the new route, then," and Captain Herd did not see him again, and he reached York Factory two days before Captain Herd. When the "General Palmer" passed the "Prince of Wales," she was hailed by Captain Herd, who asked what ship it was. The reply immediately came back, "The 'General Palmer,' and the captain presents his compliments and wishes to know whether you came by the old route or the new one," thus showing that it is to some extent a matter of chance. On another occasion, there were four vessels came out—two Company's ships and two small schooners—and one of the schooners was commanded by a very nice man indeed, and who had been in the front trading for us, but the other was commanded by a Welshman, who was intoxicated during the whole voyage. The crew consisted of two men and a boy, and this captain was found lying in the vessel about as much intoxicated as he could be, and he was continually saying "Keep her west," and he got home all safe. At one point of the Strait, in fact, he landed upon one of the islands, leaving a man and boy in charge of the vessel, and when he returned he still said "keep her west," showing that he was not much concerned about the navigation.

Q. Are you aware that two of the Company's ships ran ashore last year?—Yes; I am perfectly aware of it, although I was not on the coast at the time, but in the in-

terior. They were the "Prince of Wales" and the "Prince Arthur," and the former got off and the latter became a total wreck. The "Prince of Wales" wintered on the beach in York River. An American whaler was in company with them, and the very night they parted with the whaler they ran ashore. The officer in charge of the "Prince of Wales" wanted to go home without examining the vessel, but Dr. Cowan advised him on no account to go without the vessel had been examined, and accordingly everything was taken out of her, when it was found that there was an immense hole in the bottom, when the officer said: "Nobody but the Lord brought us to York." The "Prince of Wales" departed the following spring.

Q. Is the Hudson's Bay subect to storms?—Yes; fearful storms. On one occasion we experienced a heavy gale in crossing the Bay, and the vessell hove-to for twelve hours.

Q. What is the extent of Hudson's Bay?—I cannot say.

Q. Would you please favour the Committee with a description of the shores of Hudson's Bay?—It is a low flat coast, with no harbours for vessels. There ar several creeks and small rivers along the coast. When you come to Churchill, however, the coast is rocky and bold, and there is a good harbour there, but there is no harbour for boats betwixt North, or Nelson River and Churchill. There are harbours for small boats along the coast—Sam's Creek, Owl River, Broad River, Cape Churchill, Rough's Hill, Foxes' Island—but at Churchill River, and beyond, the coast is bold with high rocks.

Q. Would you also describe Hudson's Straits?—There is a bold rocky coast on each side; high rocks, but no trees and no vegetation, nothing but barren rocks.

Q. Snow-clad?—Oh, yes.

Q. Does the frost remain permanently in the ground round Hudson's Bay?—Yes; you can raise nothing at Churchill except a few turnips.

Q. Have any attempts at cultivation been made?—Nothing that I know of. I saw radishes and cress in a garden there, but they could succeed in raising nothing except turnips. They get imported provisions there, and they get plenty of fresh provisions from the Indians and Esquimaux—reindeer and partridge in the winter, and plenty of fish in the summer.

By Mr. Paint:

Q. In what year did the Hudson's Bay Company first establish themselves there?—I cannot say as to the exact date, but it was about 200 years ago.

By Mr. Dawson:

Q. I think it was about 1670?—Their two hundredth anniversary was in 1872.

By the Chairman:

Q. Supposing that the Canadian Government resolved to send a steamer to Hudson's Bay for the purpose of increasing our knowledge of that region, what matters should you consider should be attended to by the party in charge?—I would recommend a vessel adapted to ice navigation, and I should prefer a wooden vessel to an iron one, and I find this opinion corroborated by officers who have been in the ice, and are accustomed to ice navigation—when an iron vessel gets jammed into the ice, it is not so strong as a wooden vessel. I would suggest a vessel as strong as wood and iron can make it, especially in the bows. If a steamer, I would not advise her pushing into the pack ice, if met with, as she would be sure to have her screw damaged. Perhaps a sailing vessel would be preferable, and then again a sailing vessel's gear, blocks and tackle become useless when snow and ice form on them. They cannot work their blocks and have sometimes to put back to Churchill. Then the vessel should be fully equipped in every way, as to stores of provisions for a year, warm clothing, &c., for the crew, with a sufficient number of boats to provide for the retreat of the crew, in case the vessel was lost. I do not, however, know of any harbours in the Strait. The American whalers winter at Repulse Bay and Marble Island, but that is far north. But supposing the Government sent a vessel there, what would you want her to do.?

Q. I Suppose the plan would be for that ship to take men and establish them for the winter at several points in the Strait, and supply them with instruments, so as to enable them to make observations.—But after the vessel had landed these parties, where would she winter?

Q. I suppose she would have to go to Churchill or Ungava Bay. Do you know anything about Ungava Bay?—No; I never was at Ungava Bay.

By Mr. Dawson:

Q. Have you ever heard of that supposed channel between Ungava Bay and Mosquito Bay?—No.

By the Chairman:

Q. In view of all the circumstances, should not the Imperial Government aid in the undertaking?—I cannot say; Canada is to be benefitted by it, but I do not know how much the Imperial Government is.

Q. How long should such an expedition remain out, and what would the probable cost be?—It would have to remain out a year, or, at all events, late enough to ascertain the state of the navigation in the Strait in November and December. If the Strait was found to be blocked with drift ice, get home and go out early in June to ascertain if the Strait was passible then.

Q. What kind of a vessel would be most suitable?—A sailing vessel, with an auxilliary screw, which would be used when desired, and thus save the coal, and only use steam when obliged to do so.

Q. What are the resourses of Hudson's Bay itself and the surrounding country?—On land—deer, white patridges, and tarmigan, or white foxes, in winter, and fish in the rivers in the summer. In the sea, there are white and grey porpoises, seals and polar bears along the coast. In the Strait I do not know what is to be found; it is apparently a rocky country. We carried on whale fishing there; our complement was eight in one season, we used to make eight or nine tons of oil.

By Mr. Ross:

Q. Is there any real salmon in the Churchill River?—Some say not, but I think they are found there. I have seen the salmon at Aberdeen, and I think the same are found at Churchill.

Q. Some people say they are not found there, but that they are grilse?—They weigh, at any rate, from six to fifteen pounds, and seem to be the same as the salmon at home.

By Mr. Foster:

Q. Are those caught in the Churchill River good for use as food?—Oh, yes.

By Mr, Ross:

Q, Have you ever seen the salmon at home?—Oh, yes.

Q. But how do you account for the statement that no salmon exist inside the Straits at all?—The Esquimaux sometimes brought salmon to us in the winter, frozen. The flesh of some is of a redish colour, and of others it is a pinkish colour. I have no hesitation in saying that they are the same as the salmon in the rivers in Scotland.

By the Chairman:

Q. Are salmon to be found east of York Factory?—No.

By Mr. Paint:

Q. Are there any found in James' Bay?—No; I do not think so, but they are found to the north of James' Bay, at Fort George. The Esquimaux came from far north to trade at Churchill, the journey sometimes taking as much as two months.

By the Chairman:

Q. Please give the number of trips you have made through Hudson's Strait, Hudson's Bay or any of the harbours or rivers thereof?—Only once, I sailed from York Factory on the "Prince of Wales" a barque of 500 tons, on the 9th September, 1861, crossed the Bay in three days, was eight days in the Strait, tacking, and met several icebergs on the east end of the Strait. We ran across the Atlantic, from Cape Resolution to Lizzard Light, in ten days, with fair wind all the time. We

were nine days in a calm and in thick fog in the English Channel, and one day in the Thames, the voyage from York Factory occupying thirty-one days altogether.

Q. Are the coasts of the Strait or Bay inhabited or frequented at intervals by Indians, and if so, describe them?—Yes; the coasts are inhabited by Esquimaux, far north of Churchill, who are sometimes fallen in with in the Strait and a trifling barter carried on with them by the Company's ships and whalers. The Esquimaux come from far to the north of Churchill, and trade there in winter, in foxes, parchment and reindeer skins, principally, and also wolves, but very little ivory. In summer, a few Esquimaux hunt seals at Seal River, 60 miles north of Churchill, and trade the blubber and oil with the Hudson's Bay Company, at Churchill. There are no Indians along the shores of the coast—nothing but Esquimaux, and the Indians that used to trade at Churchill have left altogether, and gone northward. A few families of Crees are met with inland, at Otter Lake. The Chippewayans used to trade at Churchill.

By Mr. Foster:

Q. What is the ivory your speak of?—A few pieces of ivory from the walrus, which we got from the Esquimaux.

Q. Not a very large item?—Nothing at all; I do not think more than 200 pounds, which they exchanged for a few trinkets.

By the Chairman:

Q. Are the waters of the Hudson's Bay frequented yearly by other craft than the Hudson's Bay Company's ships? If so, by whom, and what is the nature of their trade?—By American whalers, who come out for the whale and seal fisheries, and to trade with the Esquimaux. They winter about Marble Island. I cannot say whether the fisheries are profitable or not, but I presume they are, or they would not return there.

Q. Do they carry on any inland trade?—No; I do not think so. They come out more particularly for the whale fisheries, and to get the oil, and while there they trade with the Esquimaux.

Q. And they winter at Marble Island?—Sometimes there, and sometimes at Repulse Bay.

By Mr. Paint:

Q. Has there been any estimate as to the population of the Esquimaux?—No; not while I was there.

By Mr. Foster:

Q. You do not consider them very numerous, do you?—No; they generally came to trade at Churchill, in parties of about fifty men, and some of them had never seen a white man before.

By Mr. Riopel:

Q. What is the number of American whalers which visit the Hudson's Bay annually?—I should think that there were not more than two.

By the Chairman:

Q. They never go down to Churchill?—No.

By Mr. Dawson:

Q. What other kinds of fish, besides salmon, do they get there?—They also catch small whitefish at Churchill.

Q. Do they ever get codfish there?—Not that I am aware of, but an old man there told me that he had found the skeleton of a large fish, supposed to be that of a codfish, but I never saw any there.

By Mr. Paint:

Q. What is the depth of water at the bar going into Churchill?—It is a fine harbor. Going in, it is narrow at the mouth, but there is no difficulty in getting in. A short distance up, it widens out like a lake, being about 5 miles wide, and then it contracts again, about 6 miles from the mouth, to about 1 mile or 1¼ miles broad. It is rather shoally there. I think the tide goes about 12 miles up the river. I should think the depth of water at the bar would be 20 feet, at all times.

As you go into the river, you see the old fort which Laperouse took in 1672. It was a regular Sebastopol.

Q. The navigators and other parties who have visited that fort say that there is from 25 to 30 feet of water there?—I should think so. Of course I am only speaking from memory. It is not a large harbour, and not more than two or three vessels could get in there at once, but they can lay right alongside the rock.

By the Chairman:

It is well sheltered?—Yes; it is well sheltered. The sea breaks right up against the rocks. Opposite the fort, on the south side, are immense high rocks which "dip" into the water.

By Mr. Paint:

Q. Is the bar sand or mud?—You do not see any bar.

Q. But at the entrance, where there is 20 feet of water. Is it sand?—I should say it was sand. The bay is sandy, and I would therefore infer that the bottom there is gravel or sand. The water is deep, and a vessel can lay-to alongside of the rocks.

By Mr. Dawson:

Q. Have you been at Moose Factory?—No; I served all my time in the northern department, from Fort Garry to Mackenzie River. I was never on the west side of the mountains, but I have been on the east side, and I have been north to the Peace River, the Mackenzie River, and the Athabasca River. I went on two occasions when inspector of the northern department—once with Governor Dlalas, in 1862, and once by myself.

By Mr. Ross:

Q. Did you ever see vegetables around Churchill?--No; it is too cold. Our provisions are all imported—flour, oatmeal, peas and a little pork. We got dried deer and fresh frozen vension from the Esquimaux. The river ice does not break up until the middle of June, and invariably they cross the ice about the 15th or 20th of June.

By Mr. Paint:

Q. Do you ever remember the river ice breaking up at the end of May?—No; I have crossed it in the middle of May, when it was just like water. I started from Churchill to go to York Factory on the 17th of May, and we had a fearful hard trip of it. We used snowshoes about half-way to Broad River, when we flung them off, and we walked from there until we came to the river, when we found the water so high on top of the ice that we could not cross over. We had to go far out to sea, until we came to a crack in the ice, where the water ran through, and we were able to get across. I left Churchill on the 17th of May, and crossed the north seal ice on the 2nd of June. Then I have gone in the month of June, when there was no snow nor water, but the mosquitoes were a fearful nuisance. I remember the Indians telling me that these shad-flies or "bull-dogs," as they were called, would kill deer, and I have seen them myself with their wings glistening, and the deer, which they choked, lying dead.

By Mr. Dawson:

Q. I have known these "bull-dogs" or shad-flies to kill oxen. Have you ever heard of them doing that?—Oh, yes. I remember on one occasion, in the spring of 1844, when we brought twenty-two young buffalo down the Saskatchewan in boats, these mosquitoes, or "bull-dogs," killed every one of them.

By Mr. Ross:

Q. What do you think of the harbour at York Factory at Fort Nelson?—There is no harbour there at all.

By Mr Brecken:

Q. When does the ice break up?—It breaks up about the middle of June, but at York Factory it breaks up from the 17th to 20th May, and sometimes about the 1st June.

Q. And when does it form in the Churchill River?—It begins to form about the middle of October. I have seen snow there in October.

MR. PAINT.—We have snow here sometimes in October.

WITNESS (continuing).—I have seen more snow in Canada (that is old Canada) than in the North-West, though of course it was colder there.

By Mr. Foster:

Q. Talking about sending a vessel out there for one year: what surveys and information could the vessel and complement gather, other than we have now?—That is what I have always said. In my opinion, no more information could be got by sending a vessel out there, than can be got from the log-books of the captains of the Hudson's Bay Company's vessels and whalers who have made many voyages out there, besides the reports of Professor Bell and others, sent down to Churchill and Nelson River, and which have been published. There is Captain Bishop, who has been a long time in the service; he was first officer on the vessel commanded by Captain Herd, in which I went home.

By the Chairman:

Q. What year was that?—That was in 1861, and they found ice in the Strait, but got through all right. But the vessel might go out there for one year and find no ice, and the next year they would find the Strait blocked up with ice. The information obtained from those who had constantly travelled the route was, in his opinion, much more valuable.

Mr. FOSTER.—It does seem to me that the aggregate experience of 200 years would outweigh all the other information.

WITNESS (continuing) —On one occasion I left Churchill on the 17th January, and got to North River in eight days, or on the 25th January, but we could not get across the river there on account of the ice-drift, so we followed up the shores of the river until we reached Seal's Island, where we crossed. We found the ice piled mountains high. Another season a vessel came back and put into Fort Churchill, and as they could only winter half the crew there, it was deemed advisable to send half the crew to York Factory, and more than one-half of them perished. Fortunately an old Indian who was hunting white partridges saved them, or they would have all perished. This Indian received a pension for saving the lives of these people. They had nothing to do but to go back to Churchil. There is no wood found along the coast there, but it is found far inland.

By Mr. Foster:

Q. Do the Hudson's Bay Company preserve the records of their captains other than their logs?—Oh, yes; they keep all the journals. At Fort Churchill I kept a journal, but I did not take away any records with me. When you asked me what I would suggest, I said I would recommend a wooden vessel; at the same time, I do not see what information you could get of more value than that from the log-books of these captains, or from the reports of Professor Bell. If, however, you sent a vessel out there, she would have to winter in some sheltered place, either in the Strait or in the Bay, and station surveying parties in the Strait. That is the only way to find out.

By Mr. Paint:

Q. It has been asserted that the Strait is more open in winter than in summer. Do you know whether that is the case or not?—I do not think it is frozen in winter on account of the currents. I remember that on one occasion the old interpreter said to me, "See the smoke out there? That smoke indicates open water; the sea is frozen so far out, and beyond that is vapor which indicates open water." I have also noticed that at York Factory, you could see the vapor rising about 12 or 15 miles out to see. But as to the Straits, you cannot decide as to its being open all winter. It might be open one winter, and the next year you would find the place all blocked up.

By the Chairman:

Q. And a ship might be blocked in the ice for the whole winter?—Yes; the only safe harbour is Churchill, and the ships always make for there; that is, the northern ships. The southern ships always make for Charleton Island.

By Mr. Paint:

Q. It has been said that there has been a vessel in the Hudson's Strait as late as Christmas, and still got home?—Perhaps so. This year they must have been very late. The "Prince of Wales" did not arrive until the 26th or 29th of September. I have a letter from my daughter, which was brought out by the "Prince of Wales," and which is dated Moose Factory, 6th October, and it is possible that she did not leave until later than that. The other one, the "Ocean Nymph," did not get home.

By Mr. Ross:

Q. There are some who say that June and July are the worst months in the year, on account of the ice breaking away from the shores?—Yes; I should think that was the case, from the fact that the vessels only leave Stromness in time to get to the Strait, about the middle of July.

By Mr. Paint:

Q. Is there not a tendency for the prevailing winds to drift James Bay full of ice?—It would appear that this captain, last year, carried the ice with him to within 100 miles of Moose Factory.

By the Chairman:

Q. In such a case, I suppose a steamer could keep clar of it?—I would advise them not to go into it all. If a steamer gets into the ice, she is apt to be damaged, and for this reason I would rather be in a wooden ship than in an iron one.

Mr. BRECKEN.—We have a vessel which runs between Prince Edward Island and the Mainland, and she draws from 17 to 18 feet of water aft, and only about 5 or 6 feet forward. This was done in order to sink the screw below the ice.

Mr. DAWSON.—And did the screw get caught in the ice?

Mr. BRECKEN.—I have made the passage in five hours, and it has sometimes taken five or six weeks, when she gets caught in the ice.

WITNESS (continuing).—It is not speed you require. You only want to decide whether the Strait is open for navigation in winter or not, and if a sailing vessel is preferable to a steamer, it does not signify if she takes a few days longer.

By Mr. Macmaster:

Q. What is the distance of Great Slave Lake, due north from the boundary line between Canada and the United States?—I could not tell that.

[Several members of the Committee—About 900 miles.]

WITNESS (continuing).—Captain Kennedy recently lectured at Selkirk, Manitoba, on the "Search for Sir Jon Franklin," and I find that the Selkirk *Herald* of February 29th closes, a report of the lecture as follows:—"In conclusion, Captain Kennedy traced the voyage on the map, and also expressed his belief that little danger need be apprehended from ice in Hudson's Strait." The same paper also had the following:—

"SHORT ROUTE TO ICELAND.—During his lecture on Tuesday evening, Captain Kennedy demonstrated by the map how, by opening the Hudson's Bay route, a short route to Iceland could be secured."

There are lots of cranberries at Churchill, and blueberries. too.

By Mr. Dawson:

Q. They are the low swampy cranberries, I suppose?—Yes; they are very good in the winter in case of scurvey.

By Mr. Ross:

Q. Are these berries not larger the farther north you go?—I do not know. Wherever there is sandy soil, you will find lots of blueberries.

Q. Does anything grow at Fort Simpson, the headquarters of the Mackenzie River district?—Yes; they grow potatoes and barley there.

Q. Are they a fair crop?—I cannot say; I only saw a small field of barley.

Q. And the potatoes?—I suppose they are a little bigger than a hen's egg.

By Mr. Paint:

Q. How far is Fort Simpson from the head of navigation?—About 300 miles. Providence is at the head of navigation on the Mackenzie River. The Roman Catho

lics have a splendid mission there. From the source of the Mackenzie River, at Great Slave Lake, down to the Arctic Sea is, according to Franklin, 1,500 miles.

By Mr. Dawson:

Q. Is the navigation good from Great Slave Lake down to Fort Simpson?—Yes. The Slave River falls into the Great Slave Lake, and I crossed the corner of the lake, which is very large, from Fort Resolution to Providence, a distance of about 250 miles, in September, and got to Fort Simpson about the 25th October.

By Mr. Foster:

Q. What kind of country is it between Great Slave Lake and Fort Churchill?—Barren grounds; it is the country of the reindeer.

Q. Is there any timber there?—I have never been there. Fort Rae is on the north end of Great Slave Lake, where a trade is carried on with the Chippewas, and from there to Fort Churchill it is barren ground.

By Mr. Dawson:

Q. Is the musk-ox found there at all?—A few of them; you might get a chance one now and again.

Q. They are very far north?—Yes; I have heard of them being killed at Seal River, 60 miles back of Churchill.

Q. They are very numerous on the back rivers, are they not?—Yes; on the great fish rivers down on the coast. The musk-ox is very different from the buffalo, and has long, shaggy hair.

By Mr. Ross:

Q. Did you ever cross over the county from Norway House to Churchill?—No; I have always gone by boat,

Q. What kind of country was it so far as you could see?—I could not tell very well from the boat. It is very rocky, with here and there a spruce or jack-pine. In the interior it is generally swampy, and all the way down to York Factory it is very hilly. As you approach the sea, you come to high rocks, with a stunted growth—you can hardly call it growth—of mosses and stunted pines. At York Factory they raise a few potatoes and radish, but they mostly use preserved potatoes.

By the Chairman:

Q. How far down do you reach frozen ground?—Not more than a foot. I recollect a friend of mine shooting a deer in July, and he took out the tongue and dug a hole in the ground and put the tongue in it to keep it fresh.

By Mr. Ross:

Q. How far inland does the cool temperature of the Hudson's Bay affect the climate? Is it not much warmer at Norway House than at Fort Nelson?—Oh, yes.

By Mr. Dawson:

Q. How far inland from York Factory do you suppose the permanently frozen ground extends?—I cannot say; I have never made any experiments, but I should think it would be several days' journey inland.

Q. Before you get past permanently frozen ground?—Yes; but a very short distance sometimes makes a considerable difference. At Pennygutway, 18 miles in the interior from York Factory, I am told that the leaves bud much earlier than at York. Of course the farther you go inland, you will find a greater difference in the climate.

Q. You say there is a good harbour at Charlton Island?—Oh, yes.

By the Chairman:

Q. Is there any marine charts of the Hudson's Bay?—Not that I am aware of. Of course, whatever charts the Company may have, can be got, I should think. The whalers must have had some.

Q. How many vessels do the Hudson's Bay Company employ?—Very few now. In former years there were always two vessels annually—and one year there were four—to York Factory, and always a large vessel to Moose Factory. Now the "Ocean Nymph" goes to York Factory. There is not more than one-quarter or one-half the tonnage into Hudson's Bay now of what there used to be, because the goods are shipped by way of Canada and the United States.

By Mr. Paint:

Q. And carried down the rivers?—Yes.

By the Chairman:

Q. It is less expensive?—Oh, yes. Of course York Factory was a very bustling place when I was there. All the supplies and the scouts used to come there.

Q. There was quite a population there then?—Oh, yes; from the middle of June until the end of July it was very busy. There were some fine stores there; in the counting-room there was some six or eight clerks, who worked from six in the morning until eight o'clock at night, and those in the stores worked from six in the morning until nine o'clock at night.

Q. York Factory was the headquarters of the Hudson's Bay Company, was it not?—Yes. The brigades used to come from the west side of the Rocky Mountains, starting from Vancouver Island in March, and go back again with the green hands or recruits.

EXAMINATION OF MR. McLEOD—(*Concluded.*)

MALCOLM McLEOD, Esq., of Ottawa, was again called before the Committee and his examination resumed and concluded.

By the Chairman:

Q. Have you any, and if so, what personal knowledge of the navigation of Hudson's Bay and Strait?—The only personal knowledge I have of the navigation of Hudson's Bay and Strait is from a voyage with my late father, John McLeod, senior, chief trader of the Hudson Bay Company, from York Factory, Hudson's Bay, to London, England.

That was in 1830, in the Company's trade ship "Prince Rupert," with the returns (furs) of that season from that point. We left York Factory at the usual time, viz., about 10th September, and arrived in London (England) on the 22nd October, or about then.

Q. Did you remark, in your voyage, any special features in the sea or land there, indicating any difficulties to navigation of either Bay or Strait, and if so state what?—I was young then, only about nine years old, but have a very clear recollection of the incident, and of the physical features and aspect of the whole scene—one vividly impressed on a mind naturally impressive, and retentive of such impressions. I remarked no difficulties to navagation, either in Bay or Strait. We started in comparative calm, and until we entered the Strait, which we did in course of the night, the sail across the Bay (600 miles) was as in a summer sea. On entering the Strait, I recollect distinctly, remarking the bright morning rays lighting, in prismatic glitter and gleam, the ice or snow-tipped distant hills or heights of the coast, then bearing easterly, with the nearest land some 5 or 6 miles off. I remarked the river-like character of the water. A strong current (flow or ebb of tide), waveless but rippled, running about 6 miles an hour, eastward. To the north, there was to the eye, naught but water—and not a particle of ice. In neither Bay or Strait did I see any ice, and not till well out in the ocean was any visible, and that only in the form of a few, widely scattered icebergs, small and much worn.

The voyage was not rough. I was not sick (sea-sick) at any time, and it was much easier, in every respect, than my voyage, some ten years afterwards, from London to New York, in an American packet-ship—the "Toronto"—in a much more southern latitude, and in face of infinitely more sea difficulty.

Q. Have you had any experience in navigation of Arctic or northern waters—marine or inland—about Hudson's Bay or Strait; and if so, state with what conclusions, as to their availability for general commerce?—I was born on Churchill waters, viz., at Green Lake, on the Beaver River, an upper affluent of the Churchill River. Its navigation is essentially a canoe one, and much broken with rapids between lakes, which abound in that region. I have navigated the North Saskatchewan from Edmonton to its discharge into Lake Winnipeg, and thence to Norway House; and from Norway House to York Factory. The conclusions I have arrived at as to

their availability for general commerce are, that from the head of Lake Winnipeg to the foot of the Rocky Mountains (which I crossed twice in early life, by the Athabasca Pass) the waters are available, easily, for general commerce by steam; but from the head of Lake Winnipeg to the Bay, not so. The "York Boat," (so-called) of the Hudson's Bay Company (with its limited capacity of, say, from three to four tons), has proved available and sufficient for the Company in its fur trade; but for heavier transport and a larger commerce, it is not so. From the Bay to Lake Winnipeg naught but a railway could serve for general commerce. I say this from a knowledge, personal, of the route from Norway House (where my father was in charge four years) to York Factory. In my book on Peace River—account of a canoe voyage by Governor Simpson from York Factory to the Pacific, and which I witnessed—I give details, physical features, distances and measurements, as given by David Thompson, Surveyor-General of the old North-West Company, as to the route from York Factory to Norway House.

Q. Have you, in your connection with the Hudson Bay Company, had any special information, or sources of information, as to the navigation of Hudson's Bay and Strait by that Company, in their trade in those waters and *parages?*—I have what I consider special information as to the subject in question, principally from private correspondence from Hudson Bay Company's officers in charge of "factories" (so-called) and other trading posts in Hudson's Bay, to my late father, Chief Trader John McLeod, senior, and, after his death, to myself, in purely private and friendly communication. I have also my father's journal as to his voyage, as clerk in the Hudson Bay Company's service, from Scotland to York Factory, in company with other vessels conveying the first shipment of Red River settlers, under the Earl of Selkirk, to that port and Churchill in 1811.

Q. Have you any record, journals, or other papers from Hudson Bay Company's officers in charge of or engaged at any of the Company's posts, factories or ports, in or about the Bay or Strait in question, and if so, will you please to give any communication of the same to this Committee, relating to the subject of navigation of the waters in question, which you may consider yourself at liberty to give?—I have such, viz.: Journal of my father as to voyage from Stornoway, Scotland, to York Factory, on the initiation of the Selkirk Settlement, in 1811, and also letters, private, to him, throughout a course of years, from chief officers in charge of principal trading posts on the Bay, and also an official report from Chief Factor Charles, in 1836, then in charge of York Factory, as to certain exceptionally disastrous incidents, there and thereabout, in the navigation of the Bay. From these I have prepared a tabular statement of arrivals and departures at different points on the Bay, covering a period of sixty-two years, viz., from 1811 to 1873, with brief explanatory notes as to these facts, and as to incidental circumstances. The papers to which these entries refer are annexed to the statement with the passages marked in red, relating to such entries.

I embody that statement in this answer, and leave the accompanying papers (in evidence) with this honourable Committee (till close of its sittings or report) for verification—the same identical papers to be returned to me when done with.

STATEMENT by M. McLeod, Barrister, of certain Arrivals and Departures of Vessels Hudson Bay, according to reports of said Company's Officers in charge of

Reference No. to annexed paper in evidence.	Date A.D.	Vessel, Name and Description.	Place of Departure.	Date of Departure.	Place of Arrival.
1	1811	Edward and Ann, ship, with others.	Stornoway, N. of Scotland.	July 25, 1811.....	York Factory, H.B....
2	1830	Prince Rupert, barque of about 350 tons.	York Factory, H.B.....	About Sept. 10, 1830.	London, Eng.....
3	1831	Prince of Wales, twin ship to above.	Moose Factory, H.B....	Aug. 6	London.....
3	1831	Prince Rupert.....	do ...	About Sept. 23...	Moose Factory.....
4	1836	do	London.....	.....	York Factory .....
4	1836	do	York Factory	Sept. 26	London.....
4	1836	Eagle, brig.....	London.....	.....	York Factory .....
5	1835	Prince George, chartered ship.	do	.....	do .....
5	1835	do ...	York Factory.....	Sept. 12.....	London.....
5	1833	Prince Rupert.....	Churchill, where wintered.	.....	York Factory .....
6	1836	Prince of Wales.....	London	.....	Moose Factory .....
7	1836	do	Moose Factory.....	Sept. 18	London.....
8	1835	Prince Rupert.....	London.....	.....	York Factory .....
9	1832	Churchill boats	Churchill.....	.....	do .....
10	1838	Vessels—departed generally.	London.....	Beginning of June	.....
11	1839	Navigation, "East Main" (East of H.B.), June 23 to Oct.....			.....
12	1865	Lady Head, ship.....	London.....	.....	Moose Factory .....
13	1847	As to anchorage at York Factory		.....	.....

at and from different points (Hudson Bay Company's Posts and "Factories") in such Posts, or there engaged, or being in passage, viz.: from 1811 to 1873.

Date of Arrival.	Return to Home Port (Britain.)	Authority.	General Explanatory Remarks.
Sept. 25, 1811....	Starting in Oct.; all got safely home, at least, naught known to the contrary.	Journal, M.S., of John McLeod, sen., Chief Trader, H.B. Co.	The voyage referred to was not the regular one with the outfit for the trade, but was an exceptional one—so at least it seems from the journal and incidental facts referred to in it—but was, with other ships, starting at the same time, and from the same place, the initiatory shipment of the new Selkirk or Red River Settlement, comprising—as the journal states, their Agricultural implements—an impedimenta, which, at York Factory, with vessel anchored, necessarily, some ten miles or more in the offing, with but few boats, and they small comparatively for lighterage—the brigades being then all off for the interior. Under these circumstances it must have been well on in October before the ship or ships started to return. See Journal. N.B.—In same season, some 140 settlers were landed at Fort Churchill.
About Oct. 22....	Returned without ice difficulty.	Personal statement of passenger.	This was a voyage by my father, said John McLeod, senior, in the Company's regular trade ship, with the returns from York Factory.
.....	.....	Chief F. Stewart, Moose Factory.	Letter from Chief Factor Alexander Stewart to my father, Chief T. McLeod, from Moose Factory. This gentleman was not in charge there then, but a passenger.
Aug. 27	Returned	do ...	do do
Sept. 25	Started for Churchill for shelter on Sept. 26. Did not arrive there, but must have run home.	Official reports, *ad hoc*, of Chief F. Charles, in charge at York Factory.	These reports (2) are very full and precise as to the exceptionally severe and early winter weather, which caused the mishaps detailed. The season was, as attested by Simpson and Leease, then in Artic exploration, exceptionally severe.
.....			
Oct. 7.....	Wintered at York, F.		
Aug. 25	Returned	Letter of Chief F. Beisley, Rupert's House, to Chief T. McLeod	This gentleman was then, and for many years before and after, in charge of Rupert's District, embracing nearly one-half of Hudson Bay coast.
.....			
Aug. 24.....	Sailed for London Aug. 30 with Returns of 1832, previous Governor.		
Sept. 1.....	Returned.....	Letter from Chief F. Robt. Miles, Rupert's House.	Chief Factor Robert Miles was for many years in charge in chief of the Bay Factories, each in turn, and it is a high Hudson Bay authority.
.....	do		
Aug. 9 (expected)	....	Letter from Chief T. Simpson.	Artic explorer. See letter from him as to season 1836.
Before July 18 ...	....	Letter from Chief T. R. H. Rae.	Showing coast navigation from Churchill open early in July.
.....	....	Letter from Chief Factor Duncan Finlayson, a leading officer, as to date of departure generally from London.	
.....	....	Letter from Chief Factor James Anderson (*b*) then clerk in charge of one of most northerly posts there, Kobucock.	
Sept. 15.....	Returned	Letter from Chief Factor James Anderson, then in charge of Moose Factory.	
.....	.....	Letter from Chief Factor J. P. Pruden, indicating nature of anchorage at York Factory.	

STATEMENT by M. McLeod, Barrister, of certain Arrivals and Departures of Vessels Hudson Bay, according to reports of said Company's Officers in charge of

Reference No. to annexed paper in evidence.	Date A.D.	Vessel, Name and Description.	Place of Departure.	Date of Departure.	Place of Arrival.
14	1838	As to exceptional severity of season, 1836	.....	.....	.....
15	1862	Ship's name not given....	Little Whale River.....	Sept. 29, 1861....	Plymouth, Eng.....
16	1867	Schooner.....	do	July 12.....	Moose Factory .....
17	1874	Ship Lady Head	Moose Factory	.....	Moose Factory (returned).

Ottawa, 4th March, 1884.

at and from different points (Hudson Bay Company's Posts and "Factories") in such Posts, or there engaged, or being in passage. viz.: from 1811 to 1873.

Date of Arrival.	Return to Home Port (Britain).	General Explanatory Remarks.
.....	.....	Letter from Chief Trader Thomas Simpson, dated Fort Confidence (Artic) as to season 1836-37.
Nov. 21.....	Reached London.....	Letter from Chief Factor James Anderson, dated Moose Factory, where in charge.
July 29.....	Ship late in starting, but reached London.	Letter from Chief Factor James Anderson, dated Moose Factory, where in charge.
.....	Stopped by ice; no date given of return.	Letter from Chief Factor James Anderson, dated Scotland, after retirement. N.B.—York ship got out same season. Fair; no ice.

MALCOLM McLEOD, *Barrister*,
(Son of late Chief Trader John McLeod, sen., Hudson Bay Co.)

Q. Have you any knowledge (personal or other) of the country bordering on any part of the Bay; and if so, state to what extent, and of what nature, as indicative of climate, relatively to this question of navigability of the Bay?—The only part of the country bordering on the Bay I have any personal knowledge of, is that on the route between Norway House and York Factory. Besides my intimate local knowledge of the climate and recurrence of seasons, of growth and non-growth about Norway House, during four years there, I can speak as to the evidences of prevailing climate throughout the route. To within the immediate coast line, say about 20 miles from the seaboard, the arboreal development of the country and its general flora is such as prevails about 150 miles due north of this—Ottawa—a line of country which I crossed some years ago *viâ* the St. Maurice River to near the height of land between this and Hudson's Bay. A climate borean, it is true, but certainly not hyper-borean. In other words, my impression is that the Bay, being essentially a *mare clausum*—land-locked almost, with an immense inpour of superheated waters from the apex of the Rocky Mountains—inpour countervailing much any purely arctic current into it, is a comparatively warm body of water for its latitude; and that, in all probability in its deeper parts, and even in its northern line, say between Churchill and the Strait, it is not frozen over even in winter; for here another factor comes into play, viz., an ever-potent tide, with a rise of from 12 to 14 feet or more. Besides, the whole basin is essentially or largely Silurian—ever warm and moving—at least I believe so.

Q. Have yon ever published such information,—and if so, in what way?—Not precisely as to this question of navigability of Bay and Strait, but as to the resources, climate, &c., of our North-West, I have written, I may say, somewhat largely for many—fully thirty years past—in press, newspapers, pamphlets and books—over *nom de plume Britannicus*, and occasionally over my own name—and ever within the truth, as now being fast proved.

Q. Have you ever, publicly, been called on to give any information on this subject,—and if you did so, state what it was, and on what based?—Some four years ago, I received from a Special Committee (Messrs. Almon, Nash and another)appointed by a "mass meeting" (so reported) of interested parties in Manitoba, held in Emerson, an application for information as to the Nelson River route for navigation by canalage with locks. My answer was that I had never been over the Nelson River route below Play Green Lake, but from what I did know of those waters and the country between Norway House and the mouth of Nelson River, close to York Factory, it was, I considered utterly impracticable, or out of the question—and incidently, I gave the general impression as to the briefness of the navigation of the Bay in that connection. The idea of a railway to Churchill or Nelson was not then mooted, at least not to me.

Q. Have you formed any opinion on the question of navigation of the Bay and Strait—its probable annual duration; its facilities or difficulties (if any), from the facts just stated by you or from other factsknown to you, but not yet stated?—On this question, as now presented, with steam as an agent applied or applicable in form and construction as found best adapted to cope with the incidental difficulties of a semi-artic navigation, such as that in question. I decidely think that the Bay at certain points in its immense littoral of fully 2,000 miles, and especially on its north-western and eastern coasts, is susceptible of a regular and safe navigation for general commercial purposes during at least four continuous months of the year, and to and from certain points, such as Churchill and certain natural harbours, on the east coast, during at least four and a-half months. At Moose Factory and York Factory, where the shore is too shallow for sea ports, and where shore ice takes comparitively early, and is comparitively late in moving there is, in fact, no ground for port. The service of shipment and discharging at these points even for the limited requirements of the fur trade, has ever, from the extreme shallowness of the water, at all seasons there, been difficult, costly, and sometimes hazardous. I say this, as to periods of navigability, not merely as an

opinion, but as a predicate on certain determined and unquestionable facts—as above narrated—leading, logically, to such conclusion.

And further, I may say that this conclusion is rather borne out than otherwise, by all the accounts of the voyagers of those waters, from James, and Gillam, and Button, and Fox, and even of Middleton, if the latter be read, as he ought to be, "between the lines"—the whole as well given in a valuable work *ad rem*, old and now probably rare, viz., "Dobb's Hudson Bay,"—a work I happen to possess, and have read with much interest in the present connetion.

As to wreckage of any vessel in the Company's service, in those waters, I have no record—have no knowledge.

I have heard of a Moose Factory ship grounding on Mansfield Island in entering, or trying to enter the Bay from the Strait, and also of another of the ships having been forced by ice to try, unsuccessfully, the narrower channel, between Mansfield Island and Southampton Island, but I don't think either vessel was wrecked Be that as it may, the marine highway there, in spite of apparent climatic difficulties, the absence of hydrographic data, has ever proved to be remarkably safe during the 200 years and more it has been used in trade. But difficulties do exist, which, to an extended commerce, pressing late and early in the short season of navigation, would become more emphatic. These would have to be at once exhaustively examined, and determined, so far as possible, viz., as to ice; where formed; its character, berg or field; its general drift, and general law of formation and movement. Also, as of equal importance, the matter of tide: its flow, ebb, rise and rate at different points in the Strait and along the whole northern and north-western shores of the Bay, and at prominent capes on the larger islands in the archipelago of that portion of the Bay and Strait. And of scarcely less importance, the matter of winds, their prevailing directions, force and character, and local effect: also, currents, local and general: and a careful hydrography of the Strait, and of the Bay in its northern parts, in the line of navigation to Churchill. As to the eastern coast (East Main) of the Bay, it has been so constantly and safely navigated by the Company's vessels—ships and schooners, &c.—during, it may be said, 200 years past, or more, as scarcely to call for special work in this direction, at the outset, as no doubt, adequate pilotage could readily be had in such line.

As to the Southern and western shores, say, from Moose Factory to York Factory, the Bay is, in fact, a huge, shallow mud pool, and utterly impracticable for port or ship, or even steamboat of lightest practicable navigation, save with auxillary lighterage, even too expensive there for general commerce.

In conclusion, I would respectfully offer an observation as to access to the Strait from the Atlantic. In recounting my voyage, from the Strait to England, I spoke of the absence (comparative) of ice all along, even in crossing the entrance of Davis Straits. In this connection, it is to be remarked that, according to concurrent reports of voyagers along the coast of Labrador, that coast is always, more or less, "pestered," as a writer on the subject terms it, with ice from the North—from the fact that there is there a conflux of ice-bearing Arctic currents from Greenland and our great northern Archipelago, and which ice, southward bound, is a formidable obstacle to navigation northwards to the Strait from any southern point, such as the Straits of Belle Isle or Cape Race—whereas to vessels to and from Britain, through Hudson's Strait, these currents are separately crossed (above their point or points of junction) and the ice difficulty, in this regard is thereby reduced to a minimum. In other words, it is easier for a vessel to get to the Strait (Hudson's) from Britain, than from our Atlantic coast, south of the Strait.

By Mr. Ross:

Q. What is your opinion about the Hudson's Strait in the winter time?—I think the Strait is open all winter. I arrive at this conclusion from the evidence of parties living in different parts of the Hudson's Bay and from the Arctic voyagers, who say that there is an immense current in the Strait.

Q. How far from the shore does the ice form at Churchill?—I never was there.

Q. Were you ever at Fort Nelson?—Yes; in the open season, but not in the winter. The opinion I gave as to the East Main shore is based upon letters from the Chief Factors and others in charge of the different posts.

Q. You think, then, a voyage could be made through the Strait and south of Greenland to Great Britain quite easily in the winter time, perhaps even more so than in the early summer?—I think there would be no difficulty in crossing Davis Straits, and in navigating the Hudson's Strait in winter. In fact I think the Straits are freer from ice in winter than in the early summer.

HOUSE OF COMMONS,
OTTAWA, 11th March, 1884.

The Select Committee appointed to take into consideration the question of the navigation of Hudson's Bay, met this morning, Mr. Dawson in the Chair, *pro tem.*

EXAMINATION OF C. J. PUSEY—(*Continued.*)

CHARLES J. PUSEY, of New York, was called before the Committee and examined:

By the Chairman:

Q. What opportunities have you had of becoming acquainted with the Hudson's Bay and the surrounding country?—I have met a great many of the whalers at New Bedford, not only the owners of the whaling ships, but the captains of the ships, who had been in Hudson's Bay.

Q. I believe you have had personal communication with these captains?—I have.

Q. Have you seen any of them lately?—I have.

Q. And what would you say was the general result of all the information you have received in regard to the navigation of the Strait?—The general result, I should think, was that navigation in the Strait is safe, on an average, for about four months in the year; from three and a-half to four months.

Q. Then probably you have some notes in regard to the matter, and perhaps you have put your views and information in a form that would be readily understood by the Committee?—I have prepared a statement which gives a general summing up of all the information which I have got, and which is as follows: The rapid growth of your North-Western Territory, and the brilliant future which awaits its development, has drawn the attention of capitalists and settlers from all parts of the world, and with the acknowledged superiority of the soil and of the many accompanying advantages resulting from the speedy settlement of that Territory, comes as a natural consequence, the careful consideration of all difficulties, imaginary or real, which may be raised, that will retard the progress of, or in any way be prejudicial to the rapid settlement and development of the country. In considering this subject, we must admit that the early completion of your great trans-continental line will remove at once all the difficulties in the way of placing the settlers of that country on an equal footing with those who have located in the far West in the United States, but the pioneer settlers of all new countries are striving to better their condition, and endeavouring to obtain facilities for doing business more cheaply, and it would seem that your North-Western country has an opportunity of doing this in a way to add immensely, not only to the facilities for doing business, but to the value of the land to the settlers by opening a direct route to Europe *vid* Hudson's Bay and Strait. The establishing of this route, while it will give so many advantages to the settlers of your North-Western country, is as yet a problem that cannot be solved from the information now available as to its practicability; as to the desirability of such a route, there can be no question, for assuming that it be practicable, and that steamers could ply between Liverpool and Hudson's Bay ports for a sufficient length of time each year as to warrant similar rates on grain as is usual by steamers from Montreal, and the distance from Winnipeg to Montreal being, say 1,400 miles, while to York Factory, on Hudson's Bay, it is only 700 miles, and taking the present rate on grain from St. Paul to

New York, which is equal to 1½ cents per ton per mile, would give you a rate from Winnipeg to Montreal of $21 per ton, or to York Factory of $10.50, just one-half; estimating grain at 33 bushels to the ton, it would make a saving on each bushel of 32 cents, and allowing your average crop of wheat in Manitoba to be 20 bushels to the acre, would add to the value of each acre under cultivation, $6.40. I need not refer to more than one item, as the same rule would apply to all exports and imports from and to that country from Europe, besides giving the emigrant a direct route from the Old Country to his new home. In referring, first, to the great advantages which will be secured by opening this route, the difficulties in the way of its accomplishments are to apt to be overlooked, and as is so often the case, the desire to secure these seeming advantages lead to a haste in determining so important a question, as may possibly lead to great mistakes. It must be borne in mind that, in order to establish such a route, you will require a large amount of capital and many years' time to divert trade into that channel, and to accomplish this it is necessary to give capitalists the most reliable evidence as to the safety of the investment. It must be admitted that while all those who have given the subject their attention are favourably impressed and firmly believe, themselves, that the route is a practicable one, no one has the evidence, as yet, to say positively that it will be found practicable for business purposes. Having my notice called to this subject some years ago, by the rapid progress of your North Western country, I have sought all the available evidence as to the navigation of the Strait, and in doing this I have had the opportunity of ascertaining the views of several captains of whaling ships, who have been on voyages to Hudson's Bay for many years, among whom I may mention Captains Sherman, Fisher, Mosher and Ash, and from Mr. William H. Gilder, who accompanied Lieutenant Schwatka in his Arctic searches; also from Dr. Bell, of your Geological Survey Department, who has gathered the most reliable information on the subject. While most of the Arctic explorers and whaling captains agree as to the route being a practicable one for, say, three and a-half to four months in the year, there are some again who consider it folly to give the subject serious consideration; but, in every instance where such opinions have been expressed, I have found that they were influenced by a fear of their business interests being injured in case the route was opened. Without going over the many points which enable us to form an opinion upon the subject, I do not hesitate to say, from all the information I have obtained, that were a proper chart made of the Strait and Bay, and lighthouses located at the points needed, you could rely on at least four months each year to navigate the Strait, and from all the evidence I have obtained, I am of the opinion that a longer period, extending probably to six months, could be relied upon. In connection with this, I may add here that the great difficulty in forming any opinion that can be safely relied upon arises from the fact that no one, so far as can be learned, has made the attempt to see just how clearly they can get through the Strait in the summer, nor how late they can pass out, their business not permitting of any such risks, they having only passed in or out when they knew it was safe. While it is conceded the navigation is safe for, say, four months in the year, it may be well to consider the difficulties attending such navigation, and that have an important bearing on it, being opened for a longer period. In going in early in the season the greatest difficulty I find is with the ice at the mouth of the Strait; at this point the ice packs at times in such a way as to almost close them, and makes it unsafe for any vessel to venture in; the ice pack is formed at this point by the floes meeting from the Hudson and Davis Straits, and by the ocean current, which curves round the south point of Greenland and up the east shore of Davis Straits and thence across and down the west shore, carrying with it much of the ice formed on the east coast of Greenland; to this I may add, the prevailing winds in the spring drive the ice westward and with the identations of the shore, commencing at Ungava Bay and thence southward along the coast of Labador, makes a great lodgment for the ice each year. This makes it difficult to make any safe calculation as to getting in the Strait earlier than the 1st of July. This, as I understand, is the greatest difficulty in the way of going in early, but should a practical passage for steamers be found to the north of

Resolution Island, which is believed to exist, all difficulties would be removed and possibly steamers could enter as early as the latter part of May, which would be as soon as the harbours on Hudson's Bay would be open. I cannot learn of any serious difficulties in passing through the Strait, arising from shallow water, rocks or fogs. The time at which vessels can safely pass out of the Strait is even more uncertain than the time for going in, but most of the evidence tends to 1st November as the latest period. From what I can learn, the time for going out of the Bay will be influenced more by the time at which the harbours in Hudson's Bay are closed, than from any difficulties in passing through the Strait. I cannot learn of any difficulties in the navigation of the Strait, except from the ice, and it is conceded by all that from the high tides and rapid currents, the Strait is never frozen over, and that which causes difficulty is the flow in the spring when the ice is going out from Fox Channel, and the inlets on the north of Hudson's Bay. This is over by May or June, and no shore ice, to any extent, floats out until the following spring, so that you can consider that the only difficulty in the way of navigating the Strait arises from the ice, and from the long dark nights in the autumn, but the latter can, in a great measure, be counteracted by properly lighting the Strait at suitable points. As to the influence and remedies which must be considered as bearing on this question, we may conclude that the time for entering the Strait will depend on how soon you can pass the ice pack at the mouth of the Strait, and the time for leaving the Bay in the fall will depend on how early the harbours are closed. Should the proposed passage to the north of Resolution Island be found practicable, steamers could, no doubt, pass through the Strait long before the ice pack at the mouth had broken up. I learn that the ice, in getting through the Strait, generally passes along the middle of the channel, leaving a good and safe passage-way for steamers along the north or south shore of the Strait. Considering the certainty of, say four months navigation, with a probability of six, and of the immense advantage this route would be, not only to your North West Territory, but in drawing a great amount of the trade from the Western States through your country, it would seem to demand the serious consideration of your Government as to the best means of determining the question. In considering the proper method of verifying the favorable evidence already obtained, I see no other way than to establish at least three stations at suitable points on the Strait, and have them under the charge of persons capable of making the most careful observations as to the various currents, temperature, fogs, flow of ice and all observations that would in any way be beneficial to the Government, either in a scientific or commercial point of view. By maintaining these stations for a series of years, and when the observations would warrant it, have a proper chart made of the Strait, Bay and harbours, and suitable lighthouses maintained at such points as experience would demonstrate to be necessary, it would not be difficult to induce capitalists to invest their means in establishing lines of steamers, or for building one or more railways to Hudson's Bay.

The witness here produced a circumpolar map, issued by the hydrographic office of the United States Navy, showing the course of the ice from the Polar regions, down the east and around the south coast of Greenland, and up the east side of Davis Straits to Baffin's Bay, and thence across and down the west shore of Davis Straits, and packing at the entrance to Hudson's Strait.

Q. You think that it is not the Bay ice then that forms in the Strait?—No, most of the ice comes down from Davis Straits and from Fox Channel into Hudson's Strait. Captain McKay has given me some valuable information on this subject. Captain Ash, who is now going in the Greeley Relief Expedition, has had a great deal of experience in the trading up Cumberland Sound, and states that when he came past the mouth of Hudson's Strait, he saw no sign of ice on the shores. This was the 28th October. All evidence goes to show that there is no difficulty from the floating ice except in the spring and early summer.

Q. Have you any letters from captains or any correspondence that would be interesting in connection with this subject?—I have two letters here—one in favour

and the other against the navigability of Hudson's Strait. The one against it is from Captain Spicer, of Groton, Connecticut, and in explanation of this letter, I may state that I wrote him, asking him a series of questions for information as to getting material for building a railway from Hudson's Bay southward, and as to the character of the labour there. His letter is as follows :—

"GROTON, CONN., 17th March, 1883.

"MR. C. H. PUSEY, New York,—Your favour, of 16th March is at hand and duly perused, and I am a little suprised to hear that the subject of a line of steamers to Hudson's Bay is still being agitated. I thought the subject had been dropped. I have been consulted before upon this matter, both in this country and in Europe, and my answer has always been the same—impracticable. But to answer your questions in order as asked, I will say.

1st. There is no average length of time to be depended upon, as there are no two years alike. In the year 1863 I battled the ice from 1st July to 22nd of August to get into Hudson's Bay, and left for home 23rd September, and it was by a piece of good fortune that I was enabled to get clear. But a gale of wind for two days cleared the south shore, so that by coasting inside the islands and rocks I got clear. The year 1862, Captain Charles Allyn, in the barque "Black Eagle," attempted to leave the Bay 10th September, but had to turn back again and winter, on account of heavy pack ice. In 1863 a Hudson's Bay Company's ship did not get into the Strait until after I did, and there were two whalers lost the same year, one 17th July and one in August, about the 20th, I think. These vessels were well fortified for the ice. The Hudson's Bay Company's ships are built expressly to combat ice, and they have found, by an experience of about 200 years of navigation there, that it is not advisable to attempt the Strait until about 1st August, and never to stop later than 15th September, except they winter, and I think there is no year that the Hudson's Strait is free from ice three months, and no steamer or vessel has any business there, except built expressly for the ice, which iron vessels are not. There are always floating icebergs.

"2nd. I have never known it to be safe in the Strait, early or late. Thick fog and snow, strong currents and icebergs are always there.

"3rd. My experience in that country for twenty-four years compels me to say I do not believe any man can tell, with certainty, within two weeks of the time he could arrive there, not only from Liverpool, but even after he had entered Hudson's Strait.

"4th. I do not think that, with a dozen trading posts on the north shore of Hudson's Bay, they would secure $3,000 worth of trade. I have had the whole shore, and never got $500 in sixteen months.

"5th. I would not guarantee to land any freight of railway material, or any other, at a given time, for anything less than cost of said freight and the liabilities of damage.

"6th. I *give it up*, for I do not know just what kind of men you might find there. (This was in answer to a question as to the character of the labour) I have seen some that were not *over-stocked in upper story*, and such might try anything.

"In my opinion, to sum up, it is simply an absurd project, and I think it would be safe to guarantee the loss of every vessel that attempts to carry wheat out of James Bay three months in the year, and I think Col. Wm. H. Gilder could have told you the same if he would, and I can point out several masters here who would tell the same story, I think. If there is any point that I have ommitted, I would be happy to answer, if asked.

"Yours respectfully,

"J. C. SPICER."

I might say, in explanation of this, that Captain Spicer has a trading post on Hudson's Strait. I have another letter here from Captain Fisher, of East Falmouth, Mass., which is as follows :—

"EAST FALMOUTH, 19th March, 1883.

"MR. PUSEY, DEAR SIR,—Yours of the 14th is received, and I will give you all the information I can, with pleasure. First, as to steam navigation through Hudson's Strait. I could not recommend over four months in the year, that is, July, August, September and October. I have been there in and out every year since 1864, up to within the last three years, and have tested the navigation through Hudson's Strait pretty well. I do not consider the Strait dangerous on account of rocks and shoals. The north part of the Bay is, and the south part of the Bay I do not know much about. As for fogs, there is more or less, but of short duration. The whale fishing of late has dropped off, but if it should be let alone a few years, I think it would be made to pay again. I think there could be a trading post started in the north part of the Bay, and be made to pay also in the Strait. As to the mines, there is the appearance of iron ore in a great many places, and mica also. I never had the time to spare for prospecting for minerals. I had to devote all my time in cruising for whales, and after going into harbour for the winter the weather, would not admit of cruising about much. As I said before, I am not much acquainted down in the south part of the Bay, but I am well posted as to the north part of the Strait. Any further information I can give you, I shall be pleased to do so.

"Yours, &c.,

"E. B. FISHER."

Captain Fisher is now in the Bay.

Q. I suppose, then, you would not be very well posted with regard to the harbours of the Bay?—No; I have never been there.

Q. During what length of time would both the Strait and the Bay be available for navigation?—At least four months, and probably six.

Q. Have losses and disasters been of frequent occurrence in the Bay?—No; I have not learned of any, except through carelessness.

Q. Are you aware of the rate of insurance on vessels to-day, into Hudson's Bay?—I am not.

Q. Are you aware that two of the Company's ships ran ashore in one year?—Yes; I heard of that. I understand that was through carelessness also. They ran ashore at Southampton Island.

Q. Where do these American whalers winter in the Bay?—At Marble Island.

Q. Have they a good harbour there?—I believe the harbour is good, although that is never taken into account. They anchor out from the Island, and are frozen in during the winter.

Q. I understood that the water was open there all winter?—Not at Marble Island. It is frozen over several miles from shore.

Q. What is your opinion as to the resources of the Bay. Fish of different kinds are abundant?—There are a great many salmon to be caught there. This information I got from these whalers, and from other sources. Then there are whales, seals and porpoises.

Q. I believe the porpoise—or the white whale—are particularly abundant?—They are, some seasons. Whalers, who have been operating in the Bay and in Cumberland Sound, inform me they are getting scarce at both places, and the general opinion seems to be that they are plentiful in Boothia Bay, which is connected with Hudson's Bay through Roe's Welcome and with Cumberland Sound by a separate channel

Q. How early in the season can they get in there?—I do not recollect, but I think about July.

Q. And then they come back in the fall, and winter at Marble Island, I suppose?—Yes; the whaling men do not venture up into the Gulf of Boothia early in the season, it would require a steamer to do that with safety.

Q. What is the value of the whale oil received in any one year?—I do not know.

By Mr. Paint:

Q. Had you access to any of the logs of these whaling captains?—Yes; I looked over a great many at New Bedford, and while I have mentioned only three or four of the captains—I have consulted probably a dozen—I have only mentioned a few of those who gave me accounts for or against.

By Mr. Ross:

Q. Do you know anything about the ice in the Strait in the winter?—I do not think there is any except that which is made there. There is no pack ice.

Q. At what time of year do you think this floating ice is the worst?—In the spring of the year when the shore ice breaks up.

Q. At any other season of the year it is clear?—Yes.

Q. How long do you think the floating ice is there?—I should think that the ice would not be an obstruction for more than three or four months.

Q. Beginning in what month?—In April.

Q. Do you think that is rather early for the ice to break up there?—Some of the whalers told me they had known it to break up in March at Marble Island.

Q. What two months are the worst for navigation in the Strait?—May and June, and I do not know that they are really so bad. The difficulty is the gathering of the ice at the mouth of the Strait. There is more difficulty there than from the floating ice in the Strait.

Q. But a steamer can go in better than a sailing vessel?—Oh, yes. Almost every navigator I have consulted expresses that opinion. With the floating ice, there is generally a channel on the north or south shore.

Q. Have you ever heard anything said about the shore ice on the Bay in the winter?—Nothing except what I have gathered from the whalers, and that is only at the northern end of the Bay. There the ice forms a long way out from the shore, in the winter time, and breaks up in spring, by the rise and fall of the tide, sometimes before the warm weather would do it.

Q. From an engineering standpoint, if the Strait open all winter, and the ice in the Bay forms, say, about two miles from the shore, is there any way in which this difficulty could be overcome, so that vessels could go in there?—No; I should not think that practicable. The ice freezes so solid that it would be almost impossible to do that. Of course, they can do a good many things now that they could not do years ago.

By Mr. Paint:

Q. Where do you think the best shipping port is in the Hudson's Bay?—It would be impossible to say. There are several good harbours—one at Moose Factory, another at York Factory, and a third at Churchill.

By Mr. Brecken:

Q. Do you know anything of Churchill?—No; I have no personal knowledge of it.

By Mr. Ross:

Q. Have you any idea as to how long the harbours remain open?—I understand about six months.

By Mr. Brecken:

Q. At Churchill?—I have only seen the records of York Factory and Moose Factory.

Q Do you know how far the ice forms out from shore?—No; I do not.

Q. What time do the New Bedford whalers generally arrive there?—They generally leave New Bedford about the latter part of May, so as to be at the mouth of the Strait when the pack ice breaks away.

Q. What time would that be?—About July. They go into the Bay and lay there for the winter. They use one season in getting there, and as soon as the ice breaks up they go into Roe's Welcome, and other places where whales are found.

Q. When does the whaling season begin?—When the ice breaks up in the spring. They generally go up to Roe's Welcome, and come out in September of the second year. It takes them a year and a half for each trip.

Q. They leave there about September?—Yes.

Q. How long can they delay coming?—I cannot say. So far as the evidence I have, there is nothing to prevent them leaving at any time in the fall or winter. The difficulty of navigating the Strait late in the season arises from the ice forming and the long, dark nights.

Q. Are these New Bedford whalers steamers?—No; they are sailing vessels.

By Mr. Paint:

Q. Barques, I suppose?—Yes.

Q. I suppose they are well sheeted at the bows, to protect them from the ice?—Yes; they are built very strong.

HOUSE OF COMMONS, MARCH 13th, 1884.

The Select Committee appointed to take into consideration the question of the navigation of the Hudson's Bay met this morning, Mr. Royal in the chair.

EXAMINATION OF RICHARD HARPER, ESQ.

Richard Harper, Esq, of Toronto, Superintendent of the Ætna Life Insurance Company, was called and examined.

By the Chairman:

Q. What knowledge have you of the navigation of the Hudson's Strait and Hudson's Bay?—From letters received from my brother-in-law, the late Mr. James Nason, during his residence of ten years in James Bay.

Q. In what capacity was your brother-in-law there?—He was chief accountant at Moose Factory, which was the place where all the general returns were made.

Q. On James Bay?—Yes.

Q. Will you please state to the Committee by extracts from these letters and documents what information you have in regard to this matter?—He did not arrive there until after the river had opened in 1876. The first date which he gives of the river being open and the ice clear of the Bay was the 21st April, 1877.

What river?—The Moose River, which empties into James Bay. In the following year, 1878, the river opened on the 2nd May; in 1879 on the 26th of April; in 1880 on the 14th of May; in 1881 on the 8th of May; and in 1882 on the 14th of May. The river closed in 1876 on the 28th November; in 1877 on the 8th November; in 1878 on the 12th November; in 1879 on the 3rd November, in 1880 on the 14th November; in 1881 on the 14th November; and he was not there when it closed in 1882.

Q. Where are these extracts taken from?—From Moose Factory.

Q. From what document?—From his own diary. The canoes were launched in 1876, on the 21st April; and the packet boats on the 13th May; in 1877 the canoes were launched on the 21st April, and the packets on the 13th May; in 1878 on the 2nd May; in 1879 on the 29th April; in 1880 on the 23rd May; in 1881 on the 28th May; and in 1882 on the 15th May, showing that they had commenced their navigation there to all the Factories round the coast. He was also very minute as to the dates when the storm sashes and double shutters were put up and taken down. In 1876 the storm sashes were put up on the 24th November, and in 1877 they were taken down on the 14th April; in 1878 they were taken down on the 25th April, and in 1879 on the 12th May; in 1880 they were taken down on the 19th April, and put up on the 12th November; in 1881 they were taken down on the 4th May, and in 1882 on the 14th April.

By Mr. Dawson:

Q. At what place was that?—Moose Factory.

To the Committee:

They commenced gardening operations, in 1877, on the 17th May at Moose Factory; in 1878 they commenced on the 1st May; in 1879 on the 4th June; in 1880 on the 23rd May; in 1881 on the 23rd April, and in 1882 on the 19th May. In 1877

they had eggs on the 25th March, flower on the 12th July and fruit was ripe on the 8th July and continued ripe until the 15th September. In 1878 they had flowers on the 1st June; cucumbers were ripe on the 30th June, and fruit on the 8th July. This corresponds very much with our season here. In 1879 they had eggs on the 2nd March, green peas on the 24th August, and potatoes on the 25th August. In 1880 they had fruit on the 18th July; in 1881 they had cucumbers on the 12th June and cauliflowers on the 1st August, and in 1882 they had fruit on the 16th August. He also kept a register with regard to the thermometer. In 1877 the thermometer on the 28th May registered 80 degrees in the shade. In 1878 they had mosquitoes on the 1st May, and in 1879 on the 21st June. In 1881 the thermometer registered 18 degrees below zero on the 4th April, and in 1882 on the 1st June they had 1¾ inches of rain, the first rain of the year. In 1876 they had snow on the 10th October, in 1877 on the 20th October, in 1880 on the 20th October and in 1881 on the 9th October. The first ship in 1876 arrived about the time he got there and left on the 20th September. In 1877 the ship arrived on the 22nd August and left on the 8th September; in 1878 it arrived on the 12th August and left on the 4th September. They had only one ship in each year, I notice by his letter the peculiar construction of the ship, composed of 16 feet of solid timber at the bow. The Hudson Bay Company's ships had a peculiarity in that respect. In 1879 the ship arrived on the 18th August and left on the 9th September. In 1880 Lieutenant Verey arrived there with the Company's ship on the 23rd August, and left on the 10th September. In 1881 the ship arrived on the 14th August and left on the 7th September. This information is taken from the general diary which he kept, but he has another record with regard to special arrivals The first arrival on record was on the 3rd August, 1751, being the *Sea Horse*, Captain John Fowler, which left on the 10th August. The latest arrival on record is the 25th September, 1811. Then he gives the arrivals of different vessels. In 1815 the *Eddystone* arrived on the 23rd August and left on the 23rd September. In 1816 the brig *Emerald* arrived on the 22nd September, and left on the 23rd October, but there is a note here to the effect that they desisted from their attempts to proceed to England on the 10th October and arrived at the Island of Stratton on the 20th and remained there for the winter. In 1831 the *Prince of Wales* arrived on the 3rd August and left on the 7th September. In 1833 the *Prince of Wales* arrived on the 6th September and left on the 24th September. The *Prince Arthur* was lost on Mansfield Island on the night of the 13th August, 1873, and there was one other, but he does not give the name of it. This was in 1864, on the night of the 13th August, on Mansfield Island; 116 pieces saved. In 1873 the *Lady Head* Prof. George B, Galbraith, arrived on the 21st August and left on the 20th September. In 1874 the *Lady Head* arrived on the 15th July from Charlton and left on the 13th September. The average date of arrivals was the 26th and 27th August in each year during the whole of that time, there being 11 arrivals on the 27th August. With regard to the Hudson's Bay produce, I have an inventory here compiled from the returns from 1840 to 1880 giving the invoice of the imported goods, of the Company's produce, the general returns, the gains or losses, and the wages paid during that time. It includes the returns from Albany, Rupert River, East Main, Moose Factory, Abittibi, Lake Shop, and trade, New Brunswick, Temiscamingue, New Post, Kemimojemi, Lake Superior, Sault Ste. Marie, Lake Huron and the southern department. These returns are compiled from these sources. In 1840 the invoice of the imported goods was £93,935, and for the ten years up to 1850, it was £69,118; in 1860 it was £100,304; in 1870 it was £94,317, for the five years up to 1875, it was £88,402, and in 1880 it was £63,848. The invoice of the Company's produce in 1840 was £8,705, and £9,303 in 1850.

By Mr. Paint.

Q. All these returns were made at Moose Factory?—Yes; but nothing has been said with regard to December, January and February, which I see were taken up entirely with the arrival and departure of dog trains from post to post.

To the Committee:

In 1860 the Company's produce was £11,851, £17,532 in 1870, £24,185 in 1875, and £15,132 in 1880. The general returns reported were: £86,694 in 1840, £55,741

in 1850, £83,670 in 1860, £40,160 in 1870, £61,938 in 1875, and £66,770 in 1880. With reference to the gain or loss, I notice that there were only two cases of loss, and both occurred at Moose Factory, being £2,337 in 1870, and £2,057 in 1875. The gains, as reported, were £51,774 in 1840, £30,821 in 1850, £35,961 in 1860, £12,830 in 1870, £34,979 in 1875, and £30,263 in 1880. With reference to the wages, the names of all the employees are given, with their ages, place of birth, etc. The wages paid were, £11,901 in 1840, £10,343 for ten years up to 1850, £12,282 to 1860, £9,122 to 1870, £10,022 to 1875, and £6,937 to 1880.

By the Chairman:

Q. Have you any personal knowledge of those territories?—None further than Winnipeg.

Q. This is all the information you have?—All, except private letters, from which these contents have been taken.

HOUSE OF COMMONS, OTTAWA, 18th March, 1884.

The Select Committee appointed to take into consideration the question of the navigation of Hudson's Bay, met this morning, Mr. Royal in the Chair.

EXAMINATION OF DR. WALTON HAYDON.

WALTON HAYDON, Esq., M.D., of Weston, Ontario, was call and examined.

By the Chairman:

Q Have you any knowledge of the navigation of Hudson's Bay and Strait?—I have been a good deal on the Bay, travelling from post to post in the Company's schooners, and I know something about the coast navigation.

Q. In what year and how long have you been coasting there?—I went out there in 1875, and left in the fall of 1883.

Q. Did you observe the time at which the shore ice used to form in the fall and break away in the spring, and also about the rivers there?—In 1879, the Moose River broke up on the 8th of April, and on the coast it went out of sight on the 12th; of course we were standing on high ground, and on looking out to sea, we could see no more ice on the shores. In 1880, the river ice went out on the 13th, and the shore ice on the 18th; in 1881, the river ice went out on the 9th, and the shore ice on the 12th; in 1882, the river ice went out on the 13th, and the shore ice on the 15th; and in 1883, the river ice went out on the 20th, and the shore ice on the 22nd. I went out to Rupert's House, in 1882, and we got into field ice on the shores leading to it on the 23rd of June. This ice was likely thrown back by the winds; it went out as far as we could see, but it was not of a very thick description, and any vessel could have pushed through it easily. It was more in shore than near the vessel.

Q. Will you please state to the Committee what you know about the navigation of the coast, since you have chiefly had experience in exploring that part of Hudson's Bay?—On the west coast it is very shallow; indeed, a small schooner of twenty tons has to keep about 4 miles out, to get a sufficient depth of water, and on the east coast it is shallow until you get to Rubert's House, but not so shallow as on the west. You get deep water at Rupert's House. (Dr. Haydon here exhibited a map of the district of Moose River, by Dr. Robert Bell, of the Geological Survey).

By Mr. Dawson:

Q Do you think that map is correct?—Certainly I do. I think this map by Dr. Bell is the only really accurate map about the Moose River. I may say that the south part of the Bay is full of shoals.

Q. There is deep water between them?—In places. There is a bar runnig across them, called the Horse-shoe Bar, and there is only a channel of 20 feet.

Q. Could channels be made through these bars of drift sand?—The Horse-shoe is permanent; the rest drift.

Q. This is north of the river?—Yes.

Q. And is it sand or clay?—Sand, I think.

Q. With clay in it probably?—Most likely.

Q. Do the tides rush up and down there with great rapidity?—From 2 to 4 miles an hour.

By the Chairman:

Q. Are you acquainted with the country between Manitoba and the Hudson's Bay and that between the great lakes and James Bay?—No; not at all.

Q. Do you know about the relative positions and characteristics of Churchill, as compared with other ports that might be affected by it?—I have no personal knowledge.

Q Have you any personal knowledge of the navigation of Hudson's Strait?—I have been through them twice. In sight of Resolution Island, on the 26th of July, 1878, going in; latitude 61° 48', and longitude 63° 39'; on the 27th, Button Islands in sight, latitude 61° 27' and longitude 64° 37'; on the 28th we were in loose ice, latitude 61° and longitude 65° 2'; on the 29th, Middle Savage Islands in sight, latitude 61° 18' and longitude 65° 40'. We stopped there and went in to trade with the Esquimaux, on the 30th, latitude 61° 30' and longitude 67° 43'; on the 31st, a large iceberg in sight, longitude 67° 40'.

By Mr. Dawson:

Q. Was that iceberg in the Strait?—Yes.

Q. Was it a very large one?—Yes; and covered with immense boulders, weighing thirty or forty tons.

Q. Which rolled from the shore?—Evidently. On the 1st of August we saw the Upper Savage Islands, latitude 62° 3', and longitude 68° 43'; the next day on the 2nd, latitude 62° 24' and longitude 70° 53'; on the 3rd, latitude 62° 55' and longitude 77° 6', and here we passed Cape Diggs, which brought us into the Bay. On the 4th, latitude was 62° 5' and longitude 80° 47'; on the 5th, latitude 60° 52' and longitude 81° 57'; on the 6th, latitude 58° 51' and longitude 82° 45'; on the 7th, latitude 57° 34' and longitude 82° 56'; on the 8th there was no observation; on the 9th, the latitude was 54° 35' and longitude 81° 25'; on the 10th, we passed the Bear Islands and the Twins, latitude 53° 47' and longitude 81° 12', and then on the 11th we brought up at the outer bar. One thing of note, I noticed on the outward trip; the wash of the sea was more on one side than the other, and the water froze in very thin layers, and it did not take long until there was quite a thick layer. It was not possible to scale it off very well from the shape of the vessel, and the anchors were all matted together from this same washing of the ice. This was in October. On the 21st October, 1883, the temperature of the air was 31°, and the water 29°; on the 22nd the air was 31°, and the water 28; on the 23rd the air was 29° and the water 28°; on the 24th, we were off Nottingham and Charles Islands, and the air was 18° and the water 24°.

Q. How can it be water at that temperature?—If it is in motion, and until the crystals begin to form, it will not set. On the 25th, the air was 20° and the water 20°; on the 26th, the air was 10° and the water 18°; on the 27th, the air was 12° and the water 18°; on the 25th, the air was 25° and the water 25°. The water in the ship's tanks was frozen on the surface.

Q. How did you determine the temperature of the water?—By taking a bucketfull on board and putting the thermometer in it. On the 28th, the air was 25° and the water 25°; on the 29th, the air was 26° and the water 34°; on the 30th, the air was 27° and the water 36°. This was at Resolution Island.

By the Chairman:

Q. Do you know whether the waters of the Hudson's Bay are frequented yearly by other crafts than the Hudson's Bay Company's ships?—In the north a good many of the American whalers go and winter at Marble Island.

Q. They carry on a trade with the Indians?—There are no Indians there, but you get an occasional Esquimaux. It is only a good wintering ground; they winter

there, so as to be able to get into the northern parts of the Bay for the whales early in the season.

Q. The Hudson's Bay Company do not do any whaling?—No; but they might make a good deal out of it. The white whale or porpoise is very plentiful there.

Q. But all you know about the whales is only hearsay?—Yes; I might also say that the ice is certainly not anything like as dense as experienced by the whalers which frequent the coast of Spitzbergen.

Q. Are these whalers steam vessels?—Wooden steam vessels. I was in Spitzbergen in 1877, which is in higher latitudes than Hudson's Bay. I went as far north as 81° 20'.

Q. The weather would be much colder there?—I was there in the summer months, and the thermometer was 3° below zero.

Q. Does the frost remain permanently in the ground around Hudson's Bay?—Not at Moose, but at Whale River it does.

Q. Supposing that the Canadian Government resolved to send a steamer to Hudson's Bay for the purpose of increasing our knowledge of that region, what matters would you consider should be attended to by the parties in charge?—I think the best way is to form several landing stations at high points on the Hudson's Strait. There are high cliffs on both sides of the Strait. Of course, you would have to build the huts strong enough to withstand the wind, and comfortable enough to keep them warm. These parties could go out towards the open waters, the presence of which is known by the fact that the haze from it can be seen 11 or 12 miles off. Another useful fact, is to learn the direction of the winds there, because you would then know on which side you will find the ice.

Q. And what period of time would you consider to be necessary for those parties to collect their information, so as to be useful?—They would require about three years, as one year varies very much with another, and by taking three years they could get a fair average. I should think that the Strait were open in the month of June. The ice would begin to go out in the month of June, because, as a rule it is so clear that the Company's ships go into the Bay in the month of July.

Q. What kind of a vessel do you think would be most suitable?—The same as the whalers are—wooden vessels—although, of course, in the middle of the season an iron vessel would do, but they will not stand the crush of the ice. I saw one iron whaler go down within three minutes after she struck the ice.

Q. Where was that?—Off Spitzbergen.

Q. Do you know whether the winds are anything like regular at certain periods of the year?—The captains of the vessels told me that the winds were very much the same at the same periods of each year.

Q. Is James Bay exposed to storms?—No worse than anywhere else. Of course, the greater danger is the shoals; you are ashore before you know it, although you are a long way out from the coast.

Q. Have you any other information which you can give the Committee with respect to the matters already mentioned?—I can give you the dates at which the Moose River was frozen over. In 1878, it was frozen over on the 3rd of November; in 1879, on the 27th; in 1880, on the 18th; in 1881, on the 6th; and in 1882, on the 17th The ice cuts large channels through the shoals at the mouth of the river, which causes them to shift. The bottom is sand.

Q. Speaking of the winds that might prevail in Hudson's Bay or Strait, can you give any information with respect to fogs?—It is only foggy in the Strait. When there is no ice, and the water is warmish, you have fogs there in the spring but not in the fall. Although there were one or two fogs coming home, they were not heavy ones. I see by the book that there was only one fog on the home voyage, and that was in the morning. On looking over the old journals, it will be found that fogs were very common there in the spring.

Q. Do you know if there are any shoals in the Strait?—I do not know of any, and never heard the captains speak of any. The great difficulty, of course, is turning the corner of the Strait to run out, the wind being generally against them. Again

the channels between the Islands are very narrow for sailing vessels, but of course it is nothing for a steamer. If the ice piles up in the Bay, it is generally on the East Main coast. The wind is from the west in the spring. With regard to Moose Factory, the population, I may say, was 449 in 1881, consisting of 87 families of Indians or equal to 385 people, and the rest was made up of 46 half-breeds and 18 whites. These Indians were mainly Crees, there being one or two Ojibbeways. Albany is about 100 miles from Moose, on the west coast; with a canoe it took two days, but with a small schooner it takes little more than a day to go there. Rupert's House is 120 miles; Fort George, about 227 miles; Great Whale River, 400 miles; Little Whale River, 460 miles; Newpost (which is up the Moose River), 100 miles; Mattawa, 600 miles; Michipicoten, 250 miles, and Abittibi, 210 miles. The Ship Sands are about 9 miles from the factory. The ship anchors in the inner ship-hold and the sands are at the west of it. The ship anchors about three-quarters of a mile from the shore of the Bay, and about 9 miles from the factory. The ship's goods are brought in a small schooner to the bars, where they are transhipped to barges. The outership-hold, where the ship brings up, is about 12 or 13 miles from the factory. The reason why the factory is not moved farther down the river, is, I suppose, that it would necessitate its re-building. The tide at Moose is 1 hour and 2 minutes later than London Bridge, and rises on an average of about 8 feet. The average temperature for Moose, in 1878, was 35·76°.

HOUSE OF COMMONS, 24th March, 1884.

The Select Committee of the House, to enquire into the navigation of Hudson's Bay, met this morning, Mr. Royal in the Chair.

EXAMINATION OF MR. SMITH.

WILLIAM SMITH, Esq., Deputy Minister of Marine and Fisheries, appeared before the Committee and was examined.

By the Chairman:

Q. You are Deputy Minister of the Department of Marine and Fisheries?—Yes, sir.

Q. Have you any personal knowledge on the subject under consideration by this Committee—the navigation of Hudson's Bay and Strait?—I have no personal knowledge. The only knowledge is that which I obtained in consequence of a conversation that I had with Chief Commissioner Graham, of the Hudson's Bay Company, when I was in Winnipeg last fall. On that occasion we were conversing about the practicability of navigating Hudson's Strait, and of obtaining a short commercial route to Europe, and I remarked that many people had an idea that a good deal of information could be got from the log-books of the Hudson's Bay Company's vessels, if they were only made accessible. Mr. Graham said he would write home to his Company in London, and ascertain whether or not they would lend their log-books. The result was that the Secretary of the Company replied that he would be happy to do so, and he accordingly sent me out a number of log-books, from which I have procured the information I have to give the Committee. I was much pleased to find that they were willing to give this information to the public, and I had a synopsis of the log-books made, bearing on the points that I knew would be of interest in the working out of this problem of the navigation of Hudson's Strait.

Q. What period of years is covered by the information you have obtained?—From 1870 to 1883, inclusive.

Q. Will you state upon what points this information principally bears?—I have had extracts made from the log-books giving data as to the time the vessels left Stromness, in the North of Scotland, in each year; the time they arrived in the Straits, giving the principal events of interest during the voyage; when they came to anchor; when they left the port in the Bay on the return trip, and when they arrived in England, and what ice they met with on the trip.

Q. Does your information give the date of entrance of the vessels into, and the duration of their passage through the Strait?—Oh, yes. I will read you one or two of those extracts from the Company's log-books, which will give you a good idea of the character of the information I have obtained.

(Here Mr. Smith read from his statement several passages, indicating to the Committee the nature of the information which he had compiled).

MR. SMITH'S STATEMENT.

The following is Mr. Smith's statement in full:—

SHIP "PRINCE RUPERT"—1870.

Left Stromness, July 3rd, 1870. Went into ice, July 27th, off Cape Resolution. Got through the ice, August 12th, and entered Hudson's Bay. Anchored at York Factory, August 20th. Left York Factory, September 18th. Met scattered ice, September 23rd. Got through the ice, September 24th. Arrived at Dungeness, October 18th. Length of voyage, 106 days.

The Bay opening on the 10th of August, and closing on the 30th of October, a steamer would make three voyages to Liverpool.

A SYNOPSIS of the difficulties encountered by the Hudson's Bay Company's ship "Prince Rupert," in navigating the Hudson's Bay, while on a voyage from London, England, to York Factory, Hudson's Bay, taken from the ship's log:—

Sailed June 12th, 1870, in company with "Ocean Nymph" and "Lady Head." Anchored in Stromness, June 19th.

July 3rd. Left Stromness. Fell in with ice, July 26th, in latitude 61.28 N., and 64.34 W. longitude.

July 27. At midnight ship hard and fast in the pack ice. At 8 a.m. Cape Resolution in sight, bearing S.E. $\frac{3}{4}$ E. Bolton's Islands, S.W. $\frac{1}{2}$ S. Strong current setting southerly. Ice very heavy, occasionally giving the ship a heavy squeeze. Rudder tackles on.

July 28th. At midnight ice opened, and ship began to forge ahead. Cast off rudder tackle. Kept the ship away, and ran out again. Spoke an American schooner, bound for Repulse Bay.

July 29th. Ship hove to eastward of Hudson's Strait. "Ocean Nymph" and "Lady Head" in sight at 8 p.m. Cape Resolution bearing N.E. $\frac{1}{2}$ N.

July 30th. Ship hove to at the entrance of Hudson's Strait. Wind, W.N.W. No possibility of entering the Strait with a foul wind.

July 31st. Dodging about all day and lying to.

August 1st. do do

August 2nd do do

August 3rd do do

August 4th. Heavy pack ice. A. M. wind S.E. Ship forging ahead. No clear water visible.

August 5th. Ship in Hudson's Strait. Ice close packed. Ship made fast to a larger floe. A.M. cast off and made sail.

August 6th. Ice occasionally opening up, and ship going ahead a little. Calm at 2 a.m. Lowered boat and towed the ship clear of an iceberg.

August 7th. Ship working her way slowly to N.N.W.

August 8th. do do do

August 9th. Ship working her way. Still in Hudson's Strait.

August 10th. Ship making better headway, averaging about 4 knots. Ice all round. At noon clear water visible to the N.W.

August 11. Working through the ice slowly.

August 12th. Left ice. Light winds prevailing. Boats towing the ship.

August 13th. Mostly clear water, with a few pieces of ice. Moderate winds Ship making about 6 knots. No ice.

August 14th. Ship making about 5 knots.

August 15th.

August 16th. Experienced difficulty with compass. 4 knots.
Hudson's Bay.—August 17th. Extreme difficulty with compass. Ship making 9 knots.
August 18th. Wind light. Ship making 4 knots.
August 19th. do do
August 20th. Anchored in York Outer Roads.

SHIP "PRINCE RUPERT"—1871.

Sailed from Stromness July 2nd, 1871.
Fell in with ice July 19th, Cape Resolution bearing north, distant 30 miles.
Had fields of thin ice up to July 22nd, when the water became quite clear. Saw several icebergs.
July 25th, sailing through thin ridges of ice. Thin ice all through Hudson's Bay. Arrived at York Factory August 9th.
Left York Factory September 20th.
September 28th. Saw several icebergs, but did not pass through any field ice on the homeward passage.
Arrived in London October 22nd.

Remarks.

Length of voyage from Stromness to York Factory and home to London 111 days.
No ice that would hinder a steamer from cutting her way steadily through it and making three voyages in the season.
Arrived at York Factory August 9th.

A SYNOPSIS of all the difficulties met by the Hudson's Bay Company's ship, *Prince Rupert*, in entering Hudson's Bay, summer of 1871:—
Sailed from London June 10th. 1871.
Sailed from Stromnes July 2nd, 1871.
Fell in with ice July 19th, Cape Resolution bearing N., distant 30 miles.
July 20th. Sailing through ridges of ice also.
July 21st. Ice not heavy; making about 4 knots.
July 22nd. Several icebergs in sight; ship in clear water 23rd and 24th.
July 25th. Sailing through thin ridges of ice.
July 26th. Clear water.
July 27th. Saw a field of ice in St. Beaux.
July 28. Ship in the ice; made fast to it.
July 29th. Made fast to ice; some open water.
July 31st. Got clear of the ice.
August 1st. Ice in sight.
August 6th. Ice in sight; 7th, in ice again.
August 7th. Got out of the ice.
Thin ice all through the Hudson's Bay.
August 9th. Arrived at York Factory.
September 20th. Left York Factory.
September 28th. Icebergs in sight (several). No field ice passed through on home trip.
Arrived in London October 22nd.
Length of voyage—Stromness to York Factory and return, 111 days.

Remarks.

No ice on this voyage to hinder a steamer from going right ahead in daylight.
A steamship could have made three voyages easy during this season.

SHIP "PRINCE RUPERT"—1872.

Sailed from London, June 10th, 1872. Left Stromness, June 30th.
July 22nd, among icebergs; foggy weather; sailing very cautiously, a great many large icebergs in one day, counted sixty.

July 29th, Cape Resolution bearing N.W. by N., 13 miles.
July 30th, in Hudson's Strait; met field ice on the 31st.
Had scattered field ice all through.
Hudson's Bay. Arrived at York Factory, August 18th.
Sailed homeward September 22nd. Saw a few icebergs in Davis Straits; arrived at London, October 26th.

Remarks.

Arrived at York Factory, August 18th, ten days later than in 1871. Owing to light winds prevailing, a steamer could have been in much earlier.

An Extract from the log of the ship *Prince Rupert*:—
Sailed from London, June 10th, 1872. Left Stromness, June 30th.
Sighted an iceberg, July 20th. 22nd, among icebergs; weather foggy; sailing very cautiously. 23rd, ship hove too; thick fog; not prudent to run. 24th, counted forty icebergs within the radius of 4 miles; strong breeze and squally; sailing very carefully among the icebergs. 26th, lying too off Hudson's Strait. thick fog and icebergs. 27th, going very carefully and sometimes lying too; got the boat out and towed clear of an iceberg. 29th, Cape Resolution bearing N.W. by N., 13 miles distant; sixty icebergs in sight. 30th, in Hudson's Strait, wind very light; a few icebergs in sight. 31st, some field ice and scattered pieces.
August 1st. Sailing among scattered ice. 2nd and 3rd, scattered ice. 4th, in clear water, Hudson's Strait. 5th to 14th, light baffling winds; on the 14th fell in with ice, hove to, thick fog. 15th, ship working through ice. 16th, in clear water. 18th, anchored in York outer roads.
Left York Factory, September 22nd, 1872; saw a few icebergs in Davis Straits.
Arrived at London, October 26th, 1872.

SHIP "PRINCE RUPERT,"—1873.

Sailed from London, June 9th, 1873.
Left Stromness, June 2nd.
Icebergs in sight, July 22nd, 23rd, 24th and 25th; 26th, no ice; 27th and 28th several icebergs.
July 29th. Cape Resolution in sight. A few icebergs in sight up to August 1st. No field ice.
August 10th. Arrived at York Factory.
September 21st. Left York Factory.
September 29th, 30th and 31st. Saw several icebergs.
October 16th. Arrived at Dungeness. Three months and fourteen days from Stromness.

Remarks.

Passed through Hudson's Strait, 31st July, and there being no field ice, it is probable a steamer could have entered, at least, ten days earlier, which, up to 31st of October, would give three months and ten days for navigation.
Synopsis of the Log Book of the Hudson's Bay Company's ship "Prince Rupert:—
Sailed from London, June 19th, 1873.
Left Stromness, July 2nd.
Several icebergs in sight, July 22nd, 23rd, 24th.
July 25th. Working up the Hudson's Strait. Light breeze and thick fog. Four ice bergs in sight.
July 26th. Thick fog. No ice.
July 27th. Several icebergs in sight.
July 28th. A few icebergs.
July 29th. Resolution Island bearing N. by E. ½ E. Light winds. Several icebergs in sight.
July 30th. Icebergs in sight.
July 31st. No ice.
August 1st. Several icebergs in sight.

August 2nd. No ice.
August 3rd and 4th, 5th and 6th. No ice.
August 7th and 8th. In Hudson's Bay.
August 10th. Arrrived off York Factory.
Left York Factory, September 21st.
September 29th. Saw several icebergs. Light wind.
September 30th. Passed several icebergs; light wind, with fog.
September 31st. Thick weather. Saw several icebergs.
October 1st and 2nd. In Hudson's Strait. No ice.
October 3rd. Clear of the ice.
October 16th. Arrived at Dungeness. Three months and fourteen days from Stromness.

"PRINCE RUPERT."—1873.

Date.	Wind.	Weather.	Icebergs.	Remarks, &c.
1873.				
July 2				Left Stromness.
do 22	Very light	Hazy	Several.	
do 23	Calm	Foggy	do	
do 24	Light	do	do	
do 25	do	do	do	
do 26	do	Thick fog.		
do 27	do	Hazy	do	
do 28	do	Clear and fog	do	
do 29	do	do	do	Off Cape Resolution.
do 30	Moderate	do	do	
do 31				
August 1			do	
do 2				
do 3				
do 4				
do 5				
do 6				
do 7				
do 8				
do 9				
do 10				Arrived at York Factory.
September 21				Left do
do 22				
do 23				
do 24				
do 25				
do 26				
do 27				
do 28				
do 29	Light		Several.	
do 30	do	Fog.		
do 31	do		do	
October 1				
do 2				
do 3				
do 4				
do 5				
do 6				
do 7				
do 8				
do 9				
do 10				
do 11				
do 12				
do 13				
do 14				
do 15				
do 16				Arrived at Dungeness.

SHIP "OCEAN NYMPH"—1874.

Sailed from London, June 23rd.

Sailed from Stromness, July 7th.

Ice in sight—icebergs—July 29th. 31st. Cape Resolution, bearing N. ¾ E.

August 1st. Surrounded by field ice; ship working through. 2nd, clear water; entered Hudson's Strait. 3rd, 4th, 5th, 6th, sailing through ice. 8th, fast in ice. 9th, forging ahead. 10th, entered Hudson's Bay. 11th, 12th, no ice. 13th, in field ice. 14th in the latitude of York Factory. 15th, ship fast in ice. 16th and 17th, made fast to ice floe. 18th, sailing through ice. 21st, no ice in sight. 22nd, arrived at Moose Factory, 340 miles south of York Factory; left again on September 13th; saw very little ice on the homeward passage.

SYNOPSIS of the difficulties encountered with Ice, by the Hudson's Bay Company.

Ship *Ocean Nymph*, voyage, 1874:—

Sailed from London, June 23; Stromness, July 7th.

The first ice was met July 29th—several icebergs and pieces of ice; strong breeze and clear weather; ship working to windward of Hudson's Straits. 30th. Light breeze; clear; several icebergs in sight. P.M., 31st. Came up to scattered ice; clear weather; Cape Resolution bearing N. ¾ E. August 1st. Surrounded by field ice; thick fog and clear at spells. 2nd. Got clear of the ice; entered Hudson's Strait and came up with ice again. 3rd. Sailing through ice. 4th. Sailing through ice to best advantage; several bergs in sight; sailed through a heavy pack of ice into open water. 5th. Several icebergs and some scattered ice in sight; clear weather and moderate wind. 6th. Some scattered ice. 7th. Sailing through heavy ridges of ice. 8th. Ice closing; ship set fast in ice. 9th. Ship forging ahead through heavy pack ice; ice scattered. 10th. Ship entered Hudson's Bay. 11th and 12th. No ice. 13th. Came into heavy field ice. 14th. Sailing through heavy ice, in latitude of York Factory. 15th. Ship fast in the ice. 16th. Made fast to a floe; three anchors ahead. 17th. Still anchored. 18th. Sailing through ice to best advantage; got into shallow water and touched the ground; wore ship and got into deeper water. 19th. In clear water; ice to eastward. 20th. Sailing through scattered ice. 21st. No ice. 22nd. Arrived at Moose Factory, 340 miles south of York Factory. September 13th. Sailed from Moose Factory. 24th. Passed through some pack ice. 25th. Cleared ice.

October 1st. In Hudson's Strait; one iceberg in sight. 3rd. Several icebergs in sight; no more ice seen on voyage home; date of arrival not known; has not been entered in log.

SHIP "OCEAN NYMPH"—1875.

Sailed from London, June 13th. Sailed from Stromness, July 9th.

In Hudson's Strait August 6th. 10th. Fell in with heavy ice. 14th. Broke a rudder gudgeon; got repaired on the 15th; was several days made fast to ice, on account of thick weather and heavy ice. 28th. Got into open water, and arrived at York Factory September 12th. Sailed again on 22nd, and was not detained by ice on the passage.

Arrived at North Foreland October 22nd.

ABSTRACT of Log of the Hudson Bay Company's Ship, "Ocean Nymph."

Left London June 13th, 1875.

Left Stromness, July 9th, 1875. 25th. Ship to the southward of Cape Farewell.

August 3rd. Ship in Davis' Straits; one iceberg in sight. 4th. Several icebergs in sight. 5th. Cape Resolution north 16 miles; ship sailing amongst scattered ice; weather foggy. 6th. In Hudson's Strait, sailing through thin, scattered ice; several icebergs in sight; at midnight thick fog, light winds. 7th and 8th. Thin ice; came up with pack ice. 9th. Working through heavy ice. 10th. Made fast to an ice floe, weather calm; p.m. made sail, fog clearing. 11th. Made fast to ice, on account o fog. 12th. Met some heavy ice, but making her way through it, with light, south-west winds. 13th. Heavy ice made ship fast with two anchors. 14th. Made sail; in going

astern broke upper rudder gudgeon and bent spindle of wheel. 15th. Damage repaired; ship made fast to the ice; ice heavy. 16th. Ship made fast to ice. 17th. Ship moving slowly. 18th. Working through heavy ice. 19th. Fog very thick; made fast to ice floe. 20th. Heaving the ship along the side of the ice; p.m., ice very close and heavy; fourteen icebergs in sight. 21st. Made fast to ice. 22nd. Ship forging ahead. 23rd. Made fast to ice. 24. Ditto. 25th. Ice opening. 26th. Thick fog; ship made fast. 27th. Ditto. 28th. Made sail, and got into open water. 29th. Ice in sight. 30th. Moderate breeze; clear weather; scattered ice in sight.

Arrived at York Factory September 12th. Sailed again on 22nd. 30th. In Hudson's Strait; came up to a thick ridge of ice, and woreship.

October 1st and 2nd. Saw several icebergs. 3rd. Cleared the Strait; was not detained by ice on the homeward passage. Arrived at North Forelands October 22nd, 1875.

SHIP "LADY HEAD,"—1875.

Sailed from Stromness July 9th, 1875.

August 7th. Entered the Hudson Strait. 9th. Got into heavy ice. Did not get clear of the ice until the 26th. Clear water 27th.

Fell in with ice September 1st, in the Hudson Bay. 10th. Arrived at Moose Factory. Sailed 26th, for London. The homeward passage not given.

AN EXTRACT of the Log Book of the Hudson's Bay Company's ship "Lady Head," on a voyage from London to Moose Factory :—

Sailed from London June 12th, 1875.

Sailed from Stromness July 9th "Ocean Nymph" in company.

August 2nd. Latitude 60° 16', longitude 57° 58 W. Icebergs in sight. 5th. Several icebergs in sight. 6th. Thick fog; hove to; day ends clear, with icebergs in sight; Cape Resolution in sight. 7th. In Hudson's Strait; calm weather; lowered a boat to tow the ship; bergs in sight. 9th. Got into heavy pack ice; fast at times. 10th. Ice slack; ship proceeding; fair wind. P.M. same date. Fast in the ice. 11th and 12th. Ship making very slow progress; ice all round; "Ocean Nymph" 3 miles astern. 13th, 14th and 15th. Working slowly among heavy pack ice. 15th. Supplied "Ocean Nymph" with two rudder-irons. 16th. Still in the ice. 17th to 24th. Fast in the ice; light winds and calms; ship off the upper Savage Islands. 25th and 26th. Ice beginning to slacken. 27th. No ice to be seen.

September 1st. Fell in with ice, latitude 63° 2' N., longitude 79° 10' W. 2nd. Got into clear water again; light winds. Arrived at Moose Factory, 10th. Sailed 26th for London.

Ship off the South Cub, the Cub bearing N.W., 7 miles distant. Here the Log has been discontinued, and shows no record of the homeward passage through the Strait.

SHIP "OCEAN NYMPH"—1876.

Sailed from London on the 14th of June, 1876. Left Stromness July 3rd.

August 19th. Entered Hudson's Strait; a few icebergs in sight until the 23rd.

Arrived at Churchill River on the 1st of September. On the 8th, sailed for York Factory, arriving on the 10th. 21st. Left York Factory, bound to London. 30th. In Hudson's Strait.

October 2nd. Several icebergs in sight. 3rd. Cleared Hudson's Strait; no ice.

Arrived off Dungeness November 7th.

AN EXTRACT of the Log of the Hudson's Bay Company's ship "Ocean Nymph," from London to Churchill, Hudson's Bay *viâ* Stromness.

Sailed from London June 14th, 1876. Sailed from Stromness July 3rd.

August 13th. Latitude 62° 16' N., longitude 62° 58' W.; several icebergs in sight. 14th. Fog setting in. 15th. Light winds and clear; several icebergs in sight. 16th. Thick fog. 17th and 18th. Cape Resolution N.W. 24 miles distant; icebergs in sight. 19th. Entered the Hudson's Strait. 20th. Three icebergs in

sight. 21st. All sail set; very thick fog; several pieces of ice in sight. 22nd. Weather clear; passed several icebergs. 23rd. Passed several pieces of ice.

September 1st. Arrived at Churchill River, not having been detained by ice during the passage out. 8th. Sailed again for York Factory. Arrived at York Factory on the 10th. 21st. Left York Factory, bound to London. 25th. Ship in Lyon's Channel; light winds and thick fog. 30th. In Hudson's Strait.

October 2nd. Saw several icebergs. 3rd. In the mouth of Hudson's Strait; no ice in sight.

Arrived off Dungeness November 7th; the ship did not have any detention from ice on this voyage.

Remarks.

The ship having entered the Straits on the 20th of August without detention by ice or fog, it is probable that the Strait could have been passed as early as the 10th.

SHIP "PRINCE OF WALES"—1876.

Sailed from London, June 12th, 1876. Sailed from Stromness, July 3rd.

August 5th. Latitude, 61° 22' N.; longitude, 61° 16' W.; sighted an iceberg; foggy. 6th. Made Cape Resolution. 17th. Entered Hudson's Bay. Arrived at Moose Factory on the 30th.

Sailed from Moose Factory, September 20th. Entered Hudson's Strait, 26th.

Left the Straits, October 3rd.

Arrived at Gravesend, November 6th.

AN EXTRACT from the Log Book of the Hudson's Bay Company's ship "Prince of Wales," from London to Moose Factory:—

Sailed from London June 12th, 1876.

Sailed from Stromness, July 3rd, 1876.

August 5th Laitude, 61° 22' N.; longitude, 61° 16' W.; sighted an iceberg to the westward; foggy weather. 6th. Made Cape Resolution N. by W.; several icebergs in sight. 8th. Hove too in fog; ship entered Hudson Bay, no ice, 17th. Arrived at Moose Factory, 30th.

Sailed for London, September 20th. 26th. Entered Hudson's Strait.

October 2nd. Several icebergs in sight. 3rd. Left Hudson's Strait.

Arrived at Gravesend, November 6th.

Remarks.

There was no obstruction or detention from ice on this voyage, as the ship was late in entering the Strait.

SHIP "OCEAN NYMPH."—1877.

Sailed from London June 17th. Stromness, July 10th.

August 6th. Standing in towards Hudson's Strait; saw several pieces of ice. 10th. Entered the Strait; three icebergs in sight. 14th. Saw some scattered ice; weather hazy; wind light. Arrived at Churchill 24th.

Sailed from York Factory September 2nd.

October 2nd. In Hudson's Strait. 3rd. Passed an iceberg, and entered Davis Strait; no ice. Arrived at London, 25th.

AN ABSTRACT of the Log of the Hudson's Bay Company's ship "Ocean Nymph," London to Churchill.

Left London June 17th, 1877.

Stromness July 10th.

August 7th. Standing in towards Hudson's Strait; wind high; thick fog; saw several pieces of ice. 7th. Fine clear weather; spoke an American schooner bound up Hudson's Strait. 9th. Cape Resolution, N. by E. ½ E., 10 miles; three icebergs in sight. 10th. Entered Hudson's Strait. 11th. All sail set; clear water; three

bergs in sight. 14th. In Hudson's Bay; passed a large iceberg and some scattered ice; weather hazy. Arrived at Churchill River 24th.

Sailed from Churchill for York Factory September 2nd. Arrived at York Factory 8th. Sailed from York Factory 22nd.

October 2nd. In Hudson's Strait. 3rd. Passed an iceberg; run out of Hudson's Strait and crossing Davis Straits; no ice. Arrived off Folkstone 24th. London 25th.

Remarks.

Entered Hudson's Strait on the 10th day of August. No detention from ice; it is probable that a steamer could have passed through several days earlier.

SHIP "PRINCE OF WALES"—1877.

London to Moose Factory.

Sailed from Stromness, July 10th.

August 4th. Cape Resolution, N.N.E., 13 miles distant; passed through some broken ice in Hudson's Strait; several icebergs in sight. 14th. Passed through a belt of ice. 16th. Saw ice to the westward; hauled up to clear it. Arrived at Moose Factory, 20th.

Sailed for London, September 8th. 19th. Ship in Hudson Strait. 22nd. Passed two icebergs.

Arrived at Gravesend, October 12th.

AN EXTRACT from the Log Book of the Hudson's Bay Company's ship "Prince of Wales," from London to Moose Factory:—

Sailed from London, June 11th, 1877.

Sailed from Stromness, July 10th.

August 3rd. Latitude 60° 23' N, lontitude 60° 42' W.; passed through a quantity of drift ice; saw one iceberg. 4th. Cape Resolution, N.N.E., 13 miles; passed through some broken ice; fresh breeze S.E; cloudy. 5th. Several icebergs in sight; ship in Hudson's Strait. 8th. Drakes Inlet, N.E. ¾ N.; North Bluff, E. ½ N.; a field of ice to the S.W. 12th. Southampton Land, N.W. and N.N.E. 14th. Passed through a belt of ice. 16th. Floating ice to the westward; hauled to the eastward to clear it; North Cub, bore S. ¼ E., 9 miles.

Arrived at Moose Factory, August 20th.

Sailed from Moose Factory, September 8th. 19th. Ship in Hudson's Strait, east end of Nottingham Island, E. by N. 22nd. Ship to eastward of Charles Island; passed two icebergs. 23rd. Thick fog; ship hove to; p.m. cleared; Cape Resolution, bore N. by E,; left Hudson's Strait.

Arrived at Gravesend, October 12th.

SHIP "OCEAN NYMPH"—1878.

Sailed from London, June 10th, 1878. Sailed from Stromness, June 29th.

July 24th. Latitude 61° 20' N., longitude 61° 60' W., Ice in sight; fresh breeze and hazy weather.

31st. In Hudson's Strait; one iceberg in sight. August 9th. Passed some heavy field ice into clear water. 11th. Stood through ice to the south-west.

August 14th. Arrived at Churchill. Sailed from York Factory, August 29th.

September 7th. In Hudson's Strait. Some ice in sight. 10th. Scattered ice in sight. Arrived off Gravenhurst, 28th.

AN ERTRACT of the Log of the Hudson's Bay Company's ship "Ocean Nymph" from London to Churchill, Hudson's Bay, 1878.

Sailed frem London, June 10th, and from Stromness on the 29th of June.

July 24th. Latitude 61° 20' N. Longitude 61° 50' W. Several icebergs in sight; fresh breeze and hazy. P.M. Scattered ice. 25th. Several icebergs in sight fresh gale of wind. 26th. Cape Resolution, N. by W. 8 miles; a number of icebers in sight; shortened sail, weather being dark and squally. 27th and 28th. Scattered ice, 29th and 30th. Icebergs and scattered ice in sight; ship in Hudson's Strait. 31st

Had the boat out to tow ship clear of an iceberg; wind light and variable; ship standing in towards North Bluff, with a light northerly wind; at midnight the Bluff bore N.E. by E. ¾ E. 12 miles.

August 3rd. Off Diggs Island. 8th. Came up to ice; shortened sail; ice to the south. 9th. Some heavy field ice; foggy weather. 11th. Stood on through the ice to the S.W. 11th. Ship in clear water; ice thickly packed to eastward; arrived at Churchill, 14th.

Sailed from York Factory, August 29th, for London.

September 7th. In Hudson's Strait, North Bluff S.E. by E. 7 miles; several icebergs in sight; some scattered ice. 10th and 11th. Left Hudson's Strait; clear of the ice; arrived off Gravesend 28th.

Remarks.

The ship met with no detention on account of ice this voyage, except on the 8th of August, when sailed was shortened.

SHIP "PRINCE OF WALES"—1878.

Sailed from London, June 10th, 1878.

Sailed from Stromness, July 29th.

July 26th. Latitude, 62° 07′ N.; longitude, 63° 55′ W. Land in sight; pack ice to the N.W.; foggy at times. 27th. Off Cape Resolution; saw a field of pack ice to the S.W. 29th. Several icebergs, and large quantities of detached ice; met with no detention from ice.

August 12th. Arrived at Moose Factory.

Sailed again, September 4th.

September 14th. In the Hudson's Strait. 21st. Left Hudson's Strait.

Arrived at Gravesend, October 11th.

EXTRACT of Log Book of the Hudson's Bay Company's ship "Prince of Wales" from London to Moose Factory, Hudson's Bay:—

Sailed from London, June 10th, 1878, with consort.

Sailed from Stromness, June 29th.

July 26th. Latitude, 62° 07′ N.; longitude, 63° 55′ W. Land in sight; several icebergs and pack ice to the N.W.; foggy at times. 27th. Cape Resolution bore N. ½ W.; light airs and calms; a field of pack ice to S.W. 28th. Tacking as required to keep clear of the ice. 29th. Several icebergs and large quantities of detached ice; 30th and 31st. Working to westward; Saddle Rock bore E. by N.; several icebergs about.

August 1st. Working up Hudson's Strait; no ice. 4th. Spoke the "Ocean Nymph." 12th. Arrived at Moose Factory. 13th. Moored ship in the inner Roads.

Sailed from Moose Factory, September 4th.

September 14th. In the Hudson's Strait. 18th. Several icebergs in sight. 19th, 20th and 21st. Icebergs in sight; left Hudson's Strait; no more ice seen on the passage.

Arrived at Gravesend, October 11th; four months on the voyage.

SHIP "OCEAN NYMPH"—1879.

Sailed from London June 12th.

Sailed from Stromness, July 1st. Entered Hudson's Strait, July 25th.

August 10th. Arrived at Churchill.

Sailed from York Factory, September 1st. 9th. In Hudson's Strait. 14th. Crossing Davis Straits.

October 3rd. Arrived off North Forelands.

EXTRACT of the Log of the Hudson's Bay Company's ship "Ocean Nymph," from London towards Hudson Bay, 1879:—

Left London, June 12th, and Stromness, July 1st.

July 25th. Ship to eastward of Cape Chudleigh; saw the land; came up with ice; took in light sail; courses up. 26th. In Hudson's Strait; clear water.

August 7th. Passed through some thin ice. 10th. Arrived at Churchill.

September 1st. Sailed from York Factory for London. 9th. In Hudson's Strait; one iceberg in sight. 14th. Crossing Davis Straits; passed one iceberg.

October 3rd. Arrival off the North Forelands.

Remarks.

The ship entered the Strait, July 25th and arrived at Churchill August 10th, without meeting any detention by ice. A steamer could have passed through as early as the 1st of August this season.

SHIP "PRINCE OF WALES"—1879.

London to Moose Factory:

Sailed from Stromness July 1st. Fell in with field ice July 22nd, in latitude 61° 35′ N., and longitude 67° 14′ W. Passed through Hudson's Strait and came up with ice 28th.

From August 1st to 15th, working slowly through close packed field ice; 18th. Arrived at Moose Factory.

September 12th. Sailed for London; 30th. In Hudson's Strait; a few icebergs in sight.

October 21st. Arrived at Gravesend.

AN EXTRACT from the Log Book of the Hudson's Bay Company's ship "Prince of Wales.

Sailed from London June 11th, 1879.

Sailed from Stromness July 1st; 22nd Latitude 61° 35′ N., longitude 67° 14′ W. Passed several pieces of field ice; temperature of water, 28°. 23rd. Several icebergs in sight. 24th, p.m. Charles Island in sight abeam, 9 miles distant. 26th. In sight of Mansfield Island; no ice. 28th. In Hudson's Bay; came up with field ice and tacked ship. 29th. Sailing through loose field ice, and came into clear water. 30th. Sailing through some loose ice. 31st. Saw heavy compact, field ice to westward.

August 1st. Ship forcing her way through close pack ice; mild, clear weather. 2nd and 3rd. Ship reaching south-westwards through ice. 4th and 5th. In ice and up to the 15th making no progress in the ice. 16th. Got into open water. 17th. Charlton Island E. by S.; Rock Lisbon, S. S. E. 18th. Arrived at Moose Factory.

September 10th. Sailed from Moose Factory. 28th. Charles Island S. W. by W., 6 miles. 29th. Savage Islands, N. E. by E. 30th. Several icebergs in sight.

October 5th. Latitude 56° 28 N., longitude 40° 24′ W.; passed an iceberg. Arrived at Gravesend 21st.

SHIP "PRINCE OF WALES"—1881.

Sailed from Stromness, June 30th.

July 28th. Cape Resolution, E.N.E. 31st. Standing up the Hudson's Strait; a great many icebergs and loose pieces of ice in sight.

August 13th. Arrived at Moose Factory.

September 7th. Sailed from Moose Factory for London. 21st. Ship in Hudson's Strait. 25th. Left Hudson's Strait; arrived at Gravesend, October 12th.

AN EXTRACT from the Log Book of the Hudson Bay Company's ship, "Prince of Wales," on a voyage from London to Moose Factory:—

Sailed from London, June 13th, 1881; sailed from Stromness, June 30th.

July 17th. Sighted Cape Farewell, N.N.E.; a sail in sight, supposed to be the "Ocean Nymph" consort. 18th Sight ice on the starboard beam. 19th. Several icebergs insight; ship making five knots. 21st. Passed a good deal of loose pack ice; did not meet any hindrance up to the 26th, when thick fog set in; hauled up the courses and hove the fore yard aback. 27th Sighted the land. 28th. Cape Resolution E.N.E. 29th. Head reaching across the mouth of Hudson's Strait; several bergs and large pieces of ice around. 31st. Standing up the Strait; a great many icebergs and loose pieces of ice.

August 1st. Three icebergs in sight, but no loose ice. 5th. Ship between Salisbury Island and the south land; no ice. 13th. Arrived at Moose Factory.

September 7th. Sailed from Moose Factory for London. 17th. Ship between Southampton and Mansfield Island. 19th. Still between Southampton and Mansfield; light winds. 21st. Cape Diggs in sight. 22nd. Three icebergs in sight. 24th. Snow squalls and several icebergs. 25th. Cape Resolution in sight; several icebergs. 27th. Ship in Davis Straits.

Arrived at Gravesend October 12th.

BARQUE "PRINCE OF WALES—"1882.

Sailed from London, June 13th, 1882. Sailed from Stromness, June 30th. July 26th. Entered Hudson's Strait; working in through heavy pack ice and icebergs, until August 1st; got clear of the ice, August 6th; ship to northward of Mansfield Island. Arrived at Moose Factory, August 15th. Sailed September 11th for London. September 24th. Entered Hudson's Strait. September 30th. Left the Hudson's Strait; some ice and icebergs in sight. October 20th. Arrived at Gravesend.

AN EXTRACT from the Log Book of the Hudson's Bay Company's barque "Prince of Wales," on a voyage from London to Moose Factory:—

Sailed from London, June 13th, 1882. Sailed from Stromness, 30th.

July 17th. Ship south of Cape Farewell. 24th. Passing through some pack ice. 25th. Ship about 100 miles S.E. of Cape Resolution; weather foggy; passing through loose ice. 26th. In Hudson's Strait; a good deal of pack ice and icebergs. 27th. Ice the same. 28th, 29th and 30th. Tacked to the westward of Upper Savages. 31st. A good deal of heavy ice and icebergs; thick fog.

August 1st. Open water between North Bluffs and Prince of Wales Island; ship making little progress; light airs and calms; several icebergs and loose pieces of ice. 3rd. Open water. 6th. Ship to the northward of Mansfield Island; no ice. 12th. Off Bear Island, reaching to the westward. 13th. Steering down James Bay under all sail. 15th. Arrived at Moose Factory.

Sailed from Moose Factory, September 11th. 14th. In James' Bay, off the Gasket Shoal. 22nd. Ship between Cape Pembroke and Nottingham Island; ran into heavy pack ice. 23rd. In the ice. 24th. Ran out of the ice off Cape Digg, in the Hudson's Strait. 29th. Cape Resolution E. by N. 16'. 30th. Ship clear of Hudson's Strait; a good many icebergs and pieces of ice in sight.

Arrived at Gravesend, October 20th.

AN EXTRACT of the Log of the Hudson's Bay Company's barque "Prince of Wales," on a voyage from London to Moose Factory, Hudson Bay:—

Left London June 11th 1883, for Stromness; left Stromness, July 1st for Moose Factory. 20th. Ship in Davis Straits latitude 61° 2' N. longtitude, 60° 53' W.; several icebergs in sight; close pack ice to the north. 21st. Standing along the edge of an extensive field of ice; several icebergs about; several heavy pieces of packed ice; ship striking heavily sometimes; standing in towards the Hudson's Strait. 22nd. The pack getting more open, but heavier pieces; ship in the mouth of Hudson's Strait; driving through heavy pack ice; reduced sail and hove to. 23rd. Ship working through heavy pack ice; thick fog; p.m. clear weather; under all sail standing into Straits. 24th. Lying too, and driving along the edge of ice; p.m. made fast to a piece of ice. 25th and 26th. In close pack. 27th and 28th. In Hudson's Strait; driving through the pack under topsails. 29th. Off the Middle Savages; no appearance of open water. 30th and 31st, and August 1st, 2nd, 3rd, 4th and 5th. In nearly the same position. 6th. Sighted east end of the Upper Savages. 7th. Ship making very little progress up to the 15th, in company with American whaler, "George and Mary" of New Bedford, and "Ocean Nymph;" no clear water up to 21st. 22nd. Working into open water. 23rd. Off Charles Island. 24th. No ice in sight. 30th. Latitute 57° 26' N.; longtitude 83° 20' W.; fell in with pack ice.

September 1st, 2nd, 3rd, 4th, 5th and 6th. Detained by ice; had heavy ice up to 18th. 19th. Ship in clear water; working into Jame's Bay. 20th. Arrived at Moose Factory.

October 7th. Sailed from Moose Factory. 25th. Ship in Hudson's Strait; off North Bluffs; passed two icebergs; clear sky and very frosty weather. 27th. Off Resolution Island; increasing gale; thick snow storm.

Arrived at Gravesend, November 16th.

STEAMSHIP "DIANA"—1881.

Sailed from London, June 14th. Sailed from Stromness, June 19th.

July 12th. Latitude, 60° 20' N.; longtitude, 59° 45' W. Came up with ice. 13th to 19th slow progress. 20th. Ice beginning to open; passed Cape Chudleigh and entered Ungava Bay. Arrived at Fort Chimo, 22nd.

Sailed from Ungava River September 2nd; did not meet with any ice on the homeward passage. Arrived at London 25th.

AN EXTRACT from the Log Book of the Hudson's Bay Company's S.S. "Diana," from London to Ungava Bay, Hudson's Strait:—

Sailed from London, June 14th, 1881. Sailed from Stromness, June 19th.

July 12th. Came up with ice; took in sail. 13th. Made fast to a large piece of ice; clear weather. 14th. Cold, clear and foggy at intervals; latitude, 59° 37' N.; longtitude, 62° 21' W.; Cape Chudleigh bore N.N.W.; made fast to the ice. 15th and 16th. Making very little progress; current setting south one mile an hour. 17th. Going ahead slowly; passing Fog Banks. 18th. Ice opening p.m.; dense fog; ship hove to; later, made fast to a piece of ice. 19th and 20th. Making slow progress; Cape Chudleigh in sight, W. ¾ N. 30 miles; entered the Bay steam and sail; ship making seven knots. 21st. Light breeze; five and six knots. 22nd. Arrived at Fort Chimo, Ungava Bay.

Sailed from Ungava River, September 2nd. Arrived at London, September 25th, not having seen or encountered any ice on the homeward passage.

STEAMSHIP "DIANA"—1882.

Sailed from London, June 9th, 1882. Sailed from Stromness, June 18th.

July 15th. In latitude 60° 04' N. longtitude 61° 44' W.; icebergs in sight; made Cape Chudleigh. 17th. Jammed in ice. 18th to 20th. Working slowly ahead. From 21st to 31st. Made fast in the ice.

August 1st. Ice moving. 4th. Clear water to the westward; going ahead full speed. 5th. Anchored in Ungava Bay.

September 13th. Sailed for London. Arrived in London, October 10th, 1882.

EXTRACT of the Log of the Hudson's Bay Company's steamer "Diana" from London to Ungava and return:—

Sailed from London, June 9th, 1882. Sailed from Stromness, June 18th.

July 12th. Spoke the steamship "Neptune" of St. John's N.F., bound to Lady Franklin Island with stores for the Artic explorers; Dr. Abbott and Mr. Walleton on board; latitude 58° 52' N.; longtitude 51° 40' W. 15th. Latitude 60° 04' N.; longtitude 61° 44' W; icebergs in sight; made Cape Chudleigh bearing N. 16th. Came up with rugged masses of field and pack ice. 17th. Ship jammed in the ice; clear water to the N.E.; found the ice impassible; made fast to a large piece. 18th. Ship forging ahead a little; ice heavy. 19th. Moving ahead slowly. 20th. Find great difficulty in getting through the ice. 21st. Jammed, no appearance of clear water in any direction. 22nd to 31st. Made fast in the ice.

August 1st. Ice moving in all directions; ship frequently in danger of being injuried by heavy ice. 2nd and 3rd. Ice apparently breaking up. 4th. Clear water to the westward; ahead full speed; p.m. stopped on account of fog. 5th. Anchored in Ungava Bay.

September 13th. Sailed from Ungava Bay. 15th. Passed several icebergs; set in fog; reduced the speed. 16th, Strong gale; no more ice seen.

Arrived in London, October 10th, 1882.

Remarks.

If this steamer had been bound to Hudson's Bay and had kept north as far as Cape Resolution, it is probable she would not have been detained very much by the ice, after the 1st August.

STEAMSHIP "DIANA"—1883.

Sailed from London, June 11th, 1883. Sailed from Stronness, June 18th.

July 12th. Fell in with ice in latitude 60° 00′ N., and longitude 59° 40′ W.; proceeding through ice very cautiously; fog and heavy ice. 21. Rounded Cape Chudleigh; ice more densely packed; steaming slow. 24th. Clear water to westward. 29th. Arrived at Fort Chimo.

Sailed September 9th. Arrived in London, October 15th; not having encountered any ice on homeward passage.

AN EXTRACT of the Log of the Hudson's Bay Company's steamship "Diana," from London to Ungava Bay and return:—

Sailed from London, June 11th, 1883. Sailed from Stromness, June 18th.

July 12th. Sighted a heavy field ice to the northward; a number of icebergs amongst it. 14th. Steaming among loose field ice; at night made fast to ice. 15th. Ice very heavy, still made fast to a floe. 16th. Proceeded again, and again obliged to stop. 17th. Dense fog; too dangerous to proceed, made fast. 18th. Fog cleared, proceeded full speed. 19th and 20th. Ship forcing her way among loose field ice; proceeding cautiously during daylight and lying to in the night. 21st. At 8 30 a.m. Rounded Cape Chudleigh. 22nd. Ice more densely packed; anchored to the ice, it not being prudent to proceed; at 1.30 p.m., proceeded slowly; very foggy; midnight closed round with ice. 23rd and 24th. Proceeding slowly; clear water seen to the westward. 25th. Proceeding cautiously. 26th. Came to anchor in 13 fathoms with port anchor and 60 fathoms of chain. 27th and 28th. No ice. 29th. Arrived at Fort Chimo, Ungava Bay.

Sailed from Ungava Bay, September 9th. Arrived in London, October 15th; not having encountered any ice on the homeward passage.

"STEAMSHIP LABRADOR"—1881.

London to the coast of Labrador and return.

AN EXTRACT from the Log Book of the Hudson's Bay Company's steamship, "Labrador," from London to Cartwright, Labrador:—

Sailed from London, May 18th; sailed from Stromness, 23rd.

Arrived at Cartwright, June 17th; sailed for Rigoulette, 18th. Arrived at Rigoulette same day; sailed 28th, for Cartwright. Arrived again same day.

Sailed for Quebec, July 5th; much ice about, causing great detention; heavy ice and many bergs; engines half speed; weather thick. Passed through Straits of Belle Isle, August 9th; no ice. Arrived at Quebec, July 12th; sailed from Quebec for Rigoulette, 23rd. Arrived at Rigoulette, 30th.

Sailed from Rigoulette, August 7th, for Davis' Inlet; arrived 9th. 16th. Sailed for Nachault; 18th, arrived at Nachault; 21st, sailed for Ungava Bay; 22nd, rounded Cape Chudleigh; 24th, arrived at Ungava, not having met any ice.

September 9th, sailed for Davis' Inlet, Rigoulette and Cartwright. 28th. Sailed for London. Arrived, October 15th.

At this point, Mr. Smith submitted a statement from Captain McElhinney, a navigator now in his Department, who had had a long experience in ice navigation, embracing his opinion as to the navigation of Hudson's Bay and Strait. He said, however, that the opinion was based entirely upon the information in the foregoing extracts. The statement is as follows:—

A SYNOPSIS of the Dates on which the Hudson's Bay Company's Ships entered and passed through the Hudson's Strait, during the Years from 1870 to 1883, inclusive.

No. of Log.	Name of Ship.	Year.	Entered.	Passed through.	Condition of the Ice.
1	Prince Rupert	1870	July 30...	August 16...	Some heavy ice.
2	do	1871	do 19...	July 29...	No detention.
3	do	1872	do 29...	August 8...	do
4	do	1873	do 29...	do 7...	do
5	Ocean Nymph	1874	August 2...	do 10...	Heavy ice two days.
6	do	1875	do 6...	do 28...	Heavy ice.
7	Lady Head	1375	do 7...	do 26...	do
8	Ocean Nymph	1876	do 19...	do 23...	No ice.
9	Prince of Wales	1876	do 6...	do 17...	No detention.
10	Ocean Nymph	1877	do 10...	do 15...	do
11	Prince of Wales	1877	do 4...	do 13...	do
12	Ocean Nymph	1878	July 31...	do 14...	do
13	Prince of Wales	1878	do 27...	do 5...	No ice.
14	Ocean Nymph	1879	do 25...	do 5...	do
15	Prince of Wales	1879	do 22...	July 28...	do
16	do	1881	do 28...	August 3...	Not detained.
17	do	1882	do 26...	do 6...	Heavy ice.
18	do	1883	do 22...	do 23...	Full of heavy ice.

The ice during the years 1870, 1875 and 1883 appears to have been exceptionally heavy, the ships having taken seventeen, twenty-two and thirty-two days, respectively, to get through the Strait. The passages made during the seasons of 1871, 1872, 1873, 1874, 1876, 1877, 1878, 1879 and 1881, the Strait was passed without any detention from ice, excepting from cautionary measures during foggy weather. Ice was seen at times, and intervals of fog, requiring great care in sailing. A steamer could have kept moving to better advantage than a sailing vessel.

The earliest date of entering the Strait, given in these logs, was July 19th, 1871, the ship taking ten days to get through. The earliest date of passing through was July 28th, 1879, taking six days to get through.

The shortest time through was made in 1876, the ship entering on August 19th, and getting through August 23rd, being in the Strait only four days. The longest time given was in 1883, the ship entering on the 22nd of July and not getting through until August 23rd. The detention here may have been caused by the ship getting jammed in the pack ice and being obliged to drift with it.

There is no record in any of these Logs as to the date of the closing of the Strait. The latest given of passing out was October 27th, 1883, having sailed from Moose Factory October 7th. No loose ice was seen in the Bay or Strait; only a few icebergs in the Strait.

I am of the opinion that steamers fitted for the work could make the passage with very little detention from ice as early as August 10th, entering after the 1st and keeping along the north shore, avoiding the pack ice.

Three months' navigation is all that could be depended on, extending from the 1st of August to the 1st of November.

M. P. McELHINNEY.

By Mr. Paint:

Q. From these extracts we find that in 1871 the "Prince Rupert" made the outward trip in thirty-eight days?—Yes; thirty-eight days from the time she left Stromness. Of course she left London some time before that, because it took a good while to get down to Stromness, and procure a crew. She laid in port at York Factory, in the Hudson's Bay, till September 20th, or forty-two days after her arrival, and on the 28th, or the eighth day of the homeward voyage, we see that she encountered ice. She arrived in London on October 22nd.

By the Chairman:

Q. Was this a sailing ship?—Yes; in fact all the ships of the Hudson's Bay Company, on this route into Hudson's Bay proper, were sailing ships. They had some steamers which ran to Ungava Bay for fish. In the previous year, we find that the voyage from Stromness to York Factory and back to London occupied 111 days. I see nothing that would hinder a steamer from making three voyages in a season, with very good weather, but perhaps when allowance has to be made for the time consumed in discharging cargo, two trips would be as many as a steamer could make in an average season.

Q. A steamer would travel that distance in eight days out and eight days home? —They would reach Cape Resolution in eight days, probably, from Liverpool. The distance is less than from New York to Liverpool.

By Mr. Brecken:

Q. Do you refer to sailing ships when you speak of a vessel making two trips in the season?—No; I am speaking of fast steamers. It would have to be an exceptionally fast steamer, and a favourable season, with as little delay as possible. Of course the vessels for this work have to be built exceptionally strong. Chief Commissioner Graham told me that the vessels were provided with double stores and double crews, against accident. The ordinary ocean vessel would not be able to go in there at all. They should be as strong as wood an iron can make them, and no expense is spared in their construction. These log books were submitted to a nautical man, in our office, Captain McElhinney, who has had a great deal of experience as captain, for some time, of the "Northern Light," working in the ice between Prince Edward Island and the Mainland. I asked him what his opinion was, after going through the whole of these logs, and he gave it to me as follows: "I am of the opinion that steamers "fitted for the work could make the passage, with very little detention from ice, as "early as August 10th, entering after the 1st, and keeping along the north shore "and avoiding pack ice. Three months' navigation is all that could be depended on, "extending from August 1st to November 1st." Of course you are aware that any person reading those extracts can form his own opinion on the question.

Q. This opinion you have just read to us is based upon those log books entirely, I presume?—Oh yes; entirely so; but Captain McElhinney is a reliable man, and he has had a good deal of experience in ice. You could not get an opinion from a more experienced man, who has not been there.

By Mr. Ross:

Q. From these log books it appears that for sailing vessels there are three months of navigation?—Yes.

Q. Do you not think there would be a great deal more for steamers?—With steamers, as you are aware, we have had some experience. We did everything possible to strengthen the "Northern Light," and make her efficient for the service, still with all that she has cost a great amount of money to keep her in repair. The character of the ice is such that an ordinary steamer could not go through at all; that is, ocean tramps, as they are called—these vessels that sail between Liverpool and New York. The ice would knock a hole in the bottom of such a vessel in a moment, and she would go down. We had to put both greenheart and iron-plating on the "Northern Light," and yet she runs a chance of incurring heavy expense for repairs at any time.

Q. She runs between what points?—Between Prince Edward Island and Nova Scotia.

Q. There is nothing to show in these logs how late vessels can go out of the Strait?—No; they never tried to go out in the winter. They seemed to be anxious to get out there early as they could, because it would shorten the time of their stay there.

By Mr. Paint:

Q. As good an idea as a person could desire to have may be obtained by reading Sir Allan Young's account of how he sailed a great deal further north in a steamship, and how he had to escape by steaming before the ice that was making after him?—

Yes; I wrote to my friend, Mr. Henderson, British Consul in Boston, to know if he could find any whaling captain who had been through the Strait and could give us any practical information on the subject. He succeeded in getting Captain J. M. Buddington, of New Bedford, Mass., a whaling captain of very large experience in th e Hudson's Bay, who in reply to his enquiries as to the feasibility of navigating the Hudson's Strait, writes as follows, under date of 26th February, 1884: "The middle of July or first of August is as early in the season as whalers can navigate the Hudson's Bay; the seasons do not vary much. I have been frozen in on the 7th, and on another season on the 11th of November. Some seasons young ice will make in September; that cements the pack, but it generally breaks up again. I think that the chances are that you cannot rely on a navigation season of longer than three months, that, is from the 1st of August until the 1st of November. As to the description of vessel best adapted to the work, I would recommend vessels of not over 14 feet draught with little deadrise to the floor-heads; such a model is much less liable to be injured by great pressure. The vessels employed in whaling are generally what we call topsail schooners, varying from 90 to 150 tons; the sheating or protection from the ice consists in filling the planking out flush with the forward part of the stern with oak timber, extra breast-hooks inside, counter braces, extra planking from load line to floor-heads and sheated with iron fore and aft from stem to fore channels. The iron used is generally 5 inches wide and $\frac{1}{4}$ in thickness. Short heavy iron straps secure the ends of the fore and aft iron, 1 foot wide, and $\frac{1}{2}$ an inch in thickness."

By Mr. Ross:

Q. What condition do you think the Straits would be in during the winter time?—I think it would be very likely to be blocked.

By Mr. Paint:

Q. There is a very strong current there, which has a tendency to keep the ice moving. There is a fall of 30 feet of water in the Bay?—Of course, if a party were stationed at the entrance or some other suitable point along the Strait, and instructed to watch the effects of the ice for twelve months, this information could all be ascertained. There are two or three points on which practical information is wanted, and the only way would be to have parties stationed in the Strait to watch the movements of the ice.

By Mr. Riopel:

Q. What advantage would it be if the channel were clear during winter, and yet the shore along the inside of the Bay were locked in ice?—It would be just the same as in Lake Superior, I suppose. Lake Superior is open all winter, but navigation is practically closed on account of the harbours and channels being blocked with shore ice. The lake itself is generally open.

HOUSE OF COMMONS, OTTAWA, 27th March, 1884.

The Select Committee of the House, to enquire into the question of the navigation of Hudson's Bay, met this morning, Mr. Royal, M.P., in the Chair.

EXAMINATION OF MR. CRAWFORD.

ROBERT CRAWFORD, Esq., of Indian Head, N.W.T., appeared before the Committee and was examined.

By the Chairman:

Q. Where do you reside, Mr. Crawford?—At Indian Head, North-West Territory.

Q. What opportunities have you had of becoming acquainted with Hudson's Bay and Strait, and the navigation of these waters?—I have never been in Hudson's Bay, but I stayed two years in Hudson's Strait in charge of Fort Chimo, in Ungava Bay, or 30 miles up the river.

Q. What knowledge have you of the navigation of Hudson's Strait?—In what way do you mean?

Q. You have resided two years at Fort Chimo?—Yes.

Q. I suppose there are one or two Hudson's Bay vessels coming to Fort Chimo every year?—When I went there there was one, but there are two now.

Q. Are they steamers or sailing vessels?—Both are steamers; one is called the "Labrador" and the other the "Diana." The "Labrader" is the regular steamer for bringing goods and taking back oil and furs; the "Diana" is a refrigerating steamer, for carrying home salmon.

Q. How long has that salmon trade been carried on there?—For four or five years.

Q. Were you there at the time it was commenced?—No; I recommended it to the Directors in London, and when I left they sent out at the "Diana."

Q. At what time do the steamers go into Ungava Bay?—The "Labrador" goes in in August; the "Diana," I understand, goes in in July. She has to get there so as to be ready for the salmon fishing.

Q. At the time you were there were there sailing vessels trading between the Old Country and Ungava Bay?—No sailing vessels trade between the Old Country and Ungava Bay. Steamers only do that work.

Q. Why?—The tides are so strong that a sailing vessel would be impracticable.

Q. You mean the tides in Ungava Bay?—Yes; the tides are very strong. The rise and fall of the tide at the mouth of the Ungava River is 64 feet. The rise and fall at Fort Chimo, 30 miles up the river, is 30 feet. So that it would not be safe to send sailing vessels there.

Q. Do the steamers meet with great difficulties in going to Ungava Bay?—I have never heard of their meeting with any difficulties. I speak, of course, of the "Labrador."

Q. Of course they have to go into the Strait to get into Ungava Bay?—I have seen an extract from the log of the "Diana," sailing from London to Fort Chimo. So far as I can see from that log, she did not meet with any ice until she got into Ungava Bay. Then she was some time in the ice—quite a number of days. They do not give any statement in that log from the time they passed Cape Chudleigh, or the Buttons, and when they did get out of the ice they were within a few hours of Ungava River. I am, therefore, satisfied that the only ice was at the bottom of Ungava Bay.

By Mr. Dawson:

Q. Is the white whale fishery regularly carried on there?—Yes; the whale is not like the regular black whale. A great many people call them porpoises. The leather is called porpoise leather, but I believe the proper name is the white whale.

Q. What people fish there. Are they Americans or English?—The Hudson's Bay Company only. We also catch salmon there.

By the Chairman:

Q. And you get whales besides?—We fish for the white whale.

Q. Extensively?—For as many as we can get. We do not send out boats after them; we do not harpoon them.

Q. Is it within your knowledge that the Hudson's Bay Company's steamers, going into the port from London, or from English ports, meet with ice or any other difficulties, on their entrance into the Strait?—I have never heard of their being troubled with ice at the entrance proper to the Strait.

Q. They are only troubled when they steer south into the Bay?—This instance of the "Diana" is the first I have heard of. The vessels will come across bits of ice, but they have never been impeded. The steamer "Labrador" has never been, to my knowledge.

Q. On board of what steamer did you go yourself?—I went to Ungava Bay on the "Labrador."

Q. At what time of the year did you go out?—I left Quebec on the 20th of July, and we got into Fort Chimo on the 7th of September. But then we had to make calls at all the different Hudson's Bay posts on the way. Of course that took up a great deal of time. Then we encountered a great deal of ice.

Q. Where?—On the Labrador coast, and going into the different ports and coming out of them. We did not meet much ice until we got to Hamilton's Inlet, or Esquimaux Bay.

By Mr. Dawson:

Q. Did you go into Hamilton Inlet?—Yes.

Q. And was it full of ice?—No; but the ice was lying off the coast.

Q. Did you meet any ice at Cape Chudleigh?—No; from Cape Meyford up to Cape Chudleigh was pretty clear of ice. The ice lay down below that, and when we got up into the entrance to the Strait we got out of the ice.

Q. What time did you leave Fort Chimo to come away?—The latter end of September.

Q. Did you meet with any ice?—No; but we saw bodies of ice, more or less of it, coasting down off the coast of Labrador.

By Mr. Brecken:

Q. Where is the salmon fishing?—All the rivers emptying into Ungava Bay have more or less salmon.

By Mr. Dawson;

Q. And the salmon are very abundant?—Yes.

Q. You can catch them in any quantities?—Yes; and that is the reason I urged the Company to send out refrigerating steamers. I had heard of refrigerating steamers coming out to London from Australia with meat. I thought it would be a good thing to have similar steamers running from Ungava Bay to London with salmon. You see our season is so short that it does not give us time to pickle the salmon properly, but we could pickle a sufficient quantity after we had sent the steamer home laden with frozen fish. After I left, they sent the steamer "Diana" out. She went back to London loaded, and she happened to be there just as an Australian vessel arrived with meat, and this Australian vessel took on board a quantity of the salmon for Australia.

By the Chairman:

Q. I suppose this business would be facilitated by the temperature of the water of the Bay; the water must be cold there?—The sea is cold.

Q. And the weather is cold during the summer?—It is cold when the wind comes from the north or the east. It is a damp cold. Of course, you may be warm enough in the middle of the day, but in the afternoon it begins to get cold.

By Mr. Brecken:

Q. When do the vessels arrive there?—From the last week of August to the first week of September.

Q. How long could a ship remain there in the fall without running the risk of not getting away?—She could leave there in October, but of course the seasons differ.

By the Chairman:

Q. You say that the date of the arrivals of the ships is from the end of August to the beginning of September?—Yes; I speak of the regular trading vessels. Of course, merchant ships or ordinary trading ships have never taken the opportunity of going there earlier.

By Mr. Brecken:

Q. You say the vessels arrive generally at the end of August or the beginning of September. Is that owing to the state of navigation?—No; I do not say it is owing to the state of navigation. You see the steamer "Labrador," belonging to the Hudson's Bay Company, is a sealing steamer. She goes to the north in the early spring—I mean up to Iceland, or north of Iceland—seal-fishing, just as the Aberdeen and Dundee ships do. She then goes back and lands her cargo at Aberdeen, or elsewhere, and afterwards goes to London and takes in her goods and supplies. She

then comes direct out to Esquimaux Bay or Hamilon Inlet. She there unloads what she can of that cargo, and leaves, perhaps, a quantity of coal. Then she comes down to Quebec and takes on board Canadian goods, such as flour and pork, and West Indian goods, such as molasses and goods of that description. She then calls at Seven Islands, or Mingen, and all the posts from Ungava Bay to Fort Chimo. Fort Chimo is her last post of call. There she begins loading oil, after which she goes down and loads at Esquimeau Bay. She has not to go to the St. Lawrence ports, because there are schooners trading between Hamilton Inlet and Quebec, so that when she arrives at Hamilton Inlet, she goes straight to London and is ready for another year.

By Mr. Dawson:

Q. The Hudson's Bay Company have a post at the head of Hamilton Inlet, have they not?—They have two posts there.

Q. What is the length of the Inlet?—I would consider it between 100 and 200 miles—about 130 miles, I should think. The distance is about 50 miles from the entrance of Hamilton Inlet to a place they call Rigoulette; then it is 90 miles from Rigoulette to North-West River, where the Hon. D. A. Smith used to be.

Q. Do you get other kinds of fish, besides salmon, at Ungava Bay?—Yes; we get beautiful sea-trout and whitefish.

Q. Any codfish?—No.

Q. Any haddock?—Not that I ever saw.

Q. Any herring?—No; our nets are not small enough for herring.

Q. Any Mackerel?—No.

By Mr. Brecken:

Q. How far does the ice make from the shore, in the depth of winter, in Ungava Bay?—I could not say the exact distance, but in hunting ptarmigan and in going over the hills, you can always see a sort of haze arising away beyond the ice. It might be five, or it might be twenty miles distant.

By Mr. Dawson:

Q. It would be open water away out there?—Yes.

By Mr. Riopel:

Q. Whether it was five or twenty miles, you could not say?—No.

By Mr. Brecken:

Q. When does the ice break up?—The ice in the river or in the Bay.

Q. The shore ice?—The ice in the river breaks up from the 10th to the 20th of June. The only means we have of knowing when the shore ice leaves is by the whales coming in. The Esquimaux have always told me that the whales never attempt to come in until the ice is gone. Of course, I do not go down to the coast to look for the ice, but in regard to the coast ice, the whales begin to come in about the 10th of July; that gave me the impression that about that date the coast ice leaves there and goes away with the tide. That is, the water is open sufficiently to allow the whales to come in.

By Mr. Dawson:

Q. Do the whales come in in immense numbers?—Thousands upon thousands of them come in. When it would be quite calm, comparatively speaking, and you walked down to the shore, you would fancy from the number of white whales that are leaping in the water that it was blowing a heavy breeze in the Bay. Of course, you have to be very wary in catching them. No matter how many of them there may be, if you frighten them, they are so timid they will fly under and be out of sight in a minute. You have to keep as quiet as if you were hunting deer.

Q. You catch them with nets, do you?—That would not be the right way of saying it. We bar them; we erect barriers, as we call them. We had very heavy tackle, and used white cotton line to make large nets, which we stretch along the shore from one point to another. It would take a long time to explain the *modus operandi*, but as soon as the fish go up the river, we have signals; and when the tide is going to turn, men are sent out to put up the barrier, and fasten large keys upon it to make the upper end float. Then the Esquimaux go out in their punts, and by frightening them, keep the fish close into the shore. If they see any indication of

fish endeavouring to get out, they strike the water with their claws, or inflated seal skin, and frighten them back; the whales then strike the bottom. When the tide goes out they are grounded; they are left by the tide high and dry.

Q. How many have you caught there at one time?—Forty-four.

Q. But you could not save all that oil?—Oh, yes.

Q. It would take a long time to cut up forty-four whales?—It is night and day work. Then we have the blubber and the skin, besides the oil. As soon as the fish are dry, the men walk out and fasten a keg or a buoy—an inflated skin—to them, and when the tide comes in the buoy and the fish are towed ashore. When they get to the smooth rocks the men haul them up closer, and there let them dry. The Esquimaux men and women immediately go to work and skin them, taking their flesh for food and pouring the oil into their seal bags.

Q. It is a sort of pemmican?—A sort of liquid pemmican.

Q. Did you ever taste the flesh?—I never went in for the flesh.

Q. Yet these Esquimaux live on it?—Yes; and you would too—if you were there long enough. It is strange what you can eat up in that cold country. Your stomach craves for fatty food.

By Mr. Brecken:

Q. The coast ice leaves about the middle of July?—Yes.

Q. When does it make?—The coast ice makes about November, but in fresh water it makes much earlier. All the ponds are frozen up before that. Of course we have snow in September.

Q. Snow that remains?—Sometimes there is. The second October I was there we had lovely weather and not much snow.

Q. But you did not live near the coast?—Thirty miles from the coast.

Q. I come from a place where we are very much troubled with ice when the coast ice commences to break up. Does it linger long, and are you subject to its return?—It depends upon the winds. It is very apt to remain, because our prevailing winds are from the north and north-west, and they tend to fill up the Bay, which seems just like a basin to hold the ice.

By the Chairman:

Q. Did you ever have an opportunity of talking with the captains of those steamers about the navigation of the Strait?—The captain of the "Labrador" never had been through the Strait. He does not go farther than Ungava Bay. That is the last port of call.

Q. What is the character of the country where you were stationed?—It is perfectly barren. The country is covered with smooth rocks, with a little moss in the valleys.

Q. Is the traffic of the Hudson's Bay Company confined to fish and oil?—Yes, and the fur trade. They get large numbers of foxes there, principally the white fox. Then the red fox comes next, and there are blue foxes and silver foxes.

Q. What you call the blue fox is the black fox in reality?—No; it is a distinct species.

Q. The silver fox and the black fox are the same, are they not?—Yes; they look black when you see them running; but they are really a very fine silver.

Q. Are there Indians in your neighbourhood?—Yes; caused by the fact of the Hudson's Bay Company having a post there. They do not belong naturally to the place. They are called barren ground Indians and they come from the interior of Labrador.

Q. And they live chiefly on fish?—No, Sir; they live on deer almost wholly; they do not live on fish. There are great numbers of Cariboo reindeer there.

Q. Are those Indians numerous there?—No; there are not many. I think the whole number of souls around Ungava Bay is something between 400 and 500, all told. Of course, some years we have more than others. They are something of the nature of the Esquimaux—they travel about. Sometimes we get some of them from Little Whale River.

By the Chairman:

Q. Do any Indians come across the Strait?—No; there are no Indians north of the Strait; but there are Esquimaux.

By Mr. Desjardins:

Q. Do they cross to Ungava Bay?—Not that I know of. It would be too long a journey for them. I have sometimes known them to be six weeks on a journey; but it is hard for them to carry their food. Of course they will go hundreds of miles for powder and shot and tobacco. They are very fond of tobacco.

Q. Are they a quiet sort of people?—The Esquimaux are very quiet and very nice.

Q. And the Indians trading at Fort Chimo—how are they?—They are nice people.

By Mr. Brecken:

Q. You distinguish between Esquimaux and Indians?—Yes; as much as you would distinguish between a Chinaman and a Highlander.

By the Chairman:

Q. The Esquimaux are a fine race?—Yes; there is no comparison between them and the Indians.

Q. Are they taller than the Indians?—Great, powerful men, most of them are.

Q. Industrious and honest in their dealings?—Very industrious and very honest.

Q. Are they of a quiet disposition?—They are of a quiet disposition. They are kind to their people, to their women and their children. They never allow their women to work.

Q. Are they visited by missionaries?—They have not been yet.

By Mr. Brecken;

Q. Have they any religion?—No; they have what are called good spirits and bad spirits. They fear the bad spirits more than they cultivate the good spirits. We had a Roman Catholic clergyman there on one occasion from the Seven Islands, in the Gulf of the St. Lawrence. He came to visit the Indians. He came overland from North-West River, at the head of Hamilton Inlet, and was six weeks making the trip.

By the Chairman:

Q. You never had any communication with people who had navigated the Strait?—No; it was impossible. Any one navigating the Strait would keep as far from us as possible.

Q. They hugged the north shore?—Yes; they hugged the north shore altogether.

Q. Is the weather very cold there?—Well, it is. As they say up there, there is an absence of heat.

By Mr. Brecken:

Q. I suppose it is a dry cold?—No; it is damp and penetrating. The prevailing winds are from the north, and they bring down the damp from the Bay. The winds we feel most are those from the east.

By the Chairman:

Q. Have any attempts at cultivation been made there?—Yes.

Q. And with what result?—We tried some radishes and some turnips. They grew little tops, but that was all.

Q. I suppose the ground is frozen?—It is never thawed.

Q. You mean within a few inches of the surface?—Within a few inches of the surface. You can go on there at any time, take away the moss, and take an axe and chop away at the ice.

Q. Did you experience great discomfort living there all winter?—No; my wife was there with me.

By the Chairman:

Q. How did you fare in regard to fuel?—We cut our own wood.

Q. Is there any wood in that region?—Above and around us there is more or less wood.

Q. Fir wood?—Chiefly spruce and tamarac, but they are small, stunted trees, knotty and rugged, and probably hundreds of years old. The wood is very hard and full of pitch. There are no tall trees at all. There are few trees so large that you could not carry them on your shoulder.

Q. Did you ever hear of any mines in the vicinity of the Fort?—Of course there are no mines; but we often heard the people speaking of the different minerals. There is iron in the Ungava River, so far as I am a judge. You can see the veins of it in the rock.

Q. Is there any coal?—Not that I know of; but there is mica. In fact the hills are mica hills.

Q. Is there a great quantity of it?—There is no doubt there must be a great quantity, because the hills are composed of it. I have seen sheets of it a foot square.

By Mr. Brecken:

Q. From your knowledge of the resources of the country, and from your observations, do you think its wealth is sufficient to warrant the opening up of communication with it?—If you are alluding to Ungava Bay, I do not.

Q. Has the Hudson's Bay country resources or wealth sufficient, supposing our prairie land was not in existence at all, to warrant the construction of a railway to connect with the interior?—I do not think so.

Q. What was the lowest the thermometer registered when you were there?—I always took it in the house when it got below 40°. I was afraid it would get broken.

By Mr. Riopel:

Q. Was it often in the house?—Sometimes it was in the house, but not often. It was very cold, and there was a good deal of wind there at times.

Q. Do the Esquimaux live to be of an old age?—Not as a general thing, but there are some old people. The Esquimaux are very kind to their women and children. They do not make their women work, except sew. They do the work themselves.

Q. Do the men have more wives than one?—They are polygamists.

Q. And they take as many wives as they can support?—Yes.

Q. Have they large families?—They have a great many children, but many die young.

Q. What do they live in?—Snow huts.

Q. Have they any fuel?—No; they have no fires. They do not even cook their food. The name "Esquimaux" means "raw meateaters."

The Committee then adjourned.

ANSWERS TO QUESTIONS.

SENT OUT BY MAIL.

At a meeting of the Committee on the 4th March, 1884, it was

Ordered, That a list of questions be sent by the clerk of the Committee to Walter Dickson, Esq., of Lake Francis, Manitoba, and Robert Crawford, Esq., of Indian Head, North-West Territory.

In compliance with the above order, the following letter was sent to the persons named:—

HOUSE OF COMMONS, OTTAWA, 4th March, 1884.

SIR,—The Select Committee of the House to enquire into the navigation of Hudson's Bay, has ordered the following list of questions sent to you. You are requested to carefully consider the same, and to give answers thereto, so far as your knowledge of the subject will enable you to do. Please place before each answer the

proper number to correspond with the number of the question answered, and address your reply to Joseph Royal, Esq., M.P., Chairman of the Committee.

I have the honour to be, Sir, your obedient servant,

CHAS. R. TUTTLE,
Clerk of the Committee.

WALTER DICKSON, Esq., Lake Francis, Manitoba.

QUESTIONS.

1. What is your profession?
2. What opportunities have you had of becoming acquainted with Hudson's Bay and the surrounding country?
3. State in particular what knowledge you have of the navigation of Hudson's Strait.
4. Are you acquainted with the country between Manitoba and Hudson's Bay, and that between the Great Lakes and James Bay?
5. Have you any knowledge of engineering?
6. What is your opinion of the feasability of building a railway from Winnipeg to Hudson's Bay, or to James Bay?
7. Would it be difficult to construct a railway from Lake Superior or Lake Huron to James Bay?
8. Do you consider Hudson's Bay and Hudson's Strait to be open for navigation long enough each year to be utilized for ordinary commerce?
9. What routes have you travelled over, or surveyed, between Lake Winnipeg and Hudson's Bay?
10. Have you seen much of the country on either side of Lake Winnipeg?
11. Would it be difficult to construct a railway on either side?
12. Is the country between the Great Lakes and James Bay difficult of railway construction?
13. What advantages to Canada generally, and to the North-West in particular, would accrue from the opening of the Hudson's Bay route?
14. What harbours are there on the west side of Hudson's Bay?
15. Are there any good harbours on James Bay?
16. Do harbours exist on the east side of Hudson's Bay proper?
17. What are the relative positions and characteristics of Churchill, as compared with other ports and routes that might be affected by it?
18. State whether or not, in you opinion, Hudson's Strait is frozen over in winter, and if not, your reasons for the supposition?
19. Are icebergs met with in Hudson's Bay or Hudson's Strait?
20. What is the nature of the ice sometimes found in Hudson's Bay?
21. During what length of time, then, would both the Bay and Strait be available for navigation?
22. Who first proposed the Hudson's Bay route?
23. Have losses and disasters been of frequent occurrence on the Bay or Strait?
24. Are you aware of the rate of insurance on vessels to-day, into Hudson's Bay?
25. Have you seen lists of the dates of the arrivals and departures of Hudson's Bay Company's ships at York and Moose Factories?
26. Are you aware that two of the Company's ships ran ashore in one year?
27. Is Hudson's Bay subject to storms?
28. What is the extent of Hudson's Bay?
29. Please favour the Committee with a short description of the shores of Hudson's Bay.
30. Would you also describe Hudson's Strait?
31. Does the frost remain permanently in the ground around Hudson's Bay?
32. What is the average temperature of the water in Hudson's Bay and Strait in the months of July, August and September.

33. Supposing that the Canadian Government resolved to send a steamer to Hudson's Bay, for the purpose of increasing our knowledge of that region, what matters should you consider ought to be attended to by the party in charge?

34. In view of all the circumstances, should not the Imperial Government aid in the undertaking?

35. How long should such an expedition remain out, and what would the probable cost be?

36. What kind of a vessel would be most suitable?

37. What are the resources of Hudson's Bay itself, and the surrounding country?

38. Please give the number of trips you have made through Hudson's Strait, Hudson's Bay, or any of the harbours or rivers thereof?

39. Give the date of each such voyage and the character of the navigation met with in respect of ice or any other impediment?

40. Are the coasts of the Strait or Bay inhabited or frequented at intervals by Indians; if so, describe them?

41. Are the waters of Hudson's Bay frequented yearly by other craft than the Hudson's Bay Company's ships. If so, by whom, and what is the nature of their trade?

42. Give an account of what you know about the whaling expeditions to Hudson's Bay?

LAKE FRANCIS, MANITOBA, 11th March, 1884.

SIR,—I have to-day received a list of questions on Hudson's Bay and the surrounding country, your Select Committee having ordered the same to be sent to me for replies at the earliest possible date.

Herewith you will please receive replies to the said questions. I have numbered the answers as requested, and trust they may be of some service to your Committee. At the same time I cannot help regretting that my answers to some of the questions have necessarily been somewhat less clear in their present shape than they would and could have been had I been called to reply to them in person.

I have found it difficult, and not at all satisfactory to myself, to have had to compress what I know on some of the points in question into such length as to suit this mode of giving information.

I am much interested in the Hudson's Bay question, have been so for many years, and will be most happy at any time to give any information in my possession, or do anything in my power towards opening up the Hudson's Bay route between Manitoba and the sea, or in any way assisting in opening up and exploring the great but little known sea of Hudson's Bay and its surrounding country.

I remain, Sir, yours respectfully,

WALTER DICKSON.

ANSWERS BY MR. DICKSON.

1. I was for many years a fur trader, and am now farming.

2. I lived for thirteen years on the coast of Hudson's Bay, and for seven years in the interior, between James Bay and Lake Superior, on the Hudson's Bay slope.

3. From a long acquaintance with Esquimaux who reside about Hudson's Strait, and from personal observation of Hudson's Bay itself, I have every reason to believe that Hudson's Strait is navagable—as is the great body of the Bay proper—at all seasons of the year, and offers no peculiar difficulty to the ordinary mariner.

4. I know a little about the country between Manitoba and Hudson's Bay, and a great deal about that between the Great Lakes and James Bay, from having frequently travelled from James Bay to Lakes Superior and Huron, by canoe and otherwise, and from having spent seven years in that region.

5. Not much; but have studied some books on the subject.

6. There are no great engineering difficulties in the way of building a railway from Winipeg to either Hudson's Bay or James Bay—rather the reverse, as much of

the country to be traversed, on either route, is very favourable for such a purpose—and wood for construction purposes is abundant along both lines.

7. In my opinion—No. 8. Yes; both of them.

9. I have never been over the whole of any route between Lake Winnipeg and Hudson's Bay.

10. I have seen all the shore of both sides of Lake Winnipeg, and know the interior, for a considerable distance inland, along its western side.

11. It would, in my opinion, be much easier to build a railway on the western than on the eastern side of Lake Winnipeg. The western side, being the region between Lake Winnipeg and Lakes Manitoba and Winnipegoosis, offers many facilities for the construction of a railway. On the eastern side the country is generally rough and unproductive.

12. No. A good route, and much of it through a good country—covered with valuable timber—might easily be found from either lake Huron or Lake Superior to James Bay.

13. The advantages to Canada generally of the opening up of Hudson's Bay, would be the giving access to a region of minerals, which for variety, richness and extent is equal—perhaps superior to anything of the sort on the continent—to sealing and whaling grounds that are already highly renumerative and capable of great development, and to salmon and other fisheries, to game in unlimited quantity, and to the richest fur-producing region of the Dominion. To Manitoba and the North-West, the route *via* Hudson's Bay would be all importaut—giving a shorter and cheaper route for both imports and exports than can possibly be had by any other route now known.

14. Churchill River is, I believe, the only real harbour at present known to us on the west coast of Hudson's Bay. The other so-called harbours, as at York Factory being only roadsteads of a very low order, and not always safe.

15. There are no harbours that could be classed as good anywhere around James Bay, unless for crafts of very light draught of water; the only harbour fit for use at Moose Factory being an indifferent roadstead, and in tide water.

16. Yes; both about the Mainland and among the sounds and islands along the coast—all in tide water.

17. Churchill Harbour is nearer to Liverpool by some 80 miles than is Montreal, and upwards of 300 miles near the same place than New York. At present no comparison can be instituted between Churchill and any other port on the west coast of Hudson's Bay, for strictly speaking there is no other port at present known. The distance between Winnipeg and Churchill is from 400 miles to 600 miles according to the route that may be chosen—giving in either case, a much shorter route for Manitoba and the North-West generally to the seaboard, and consequently to the markets of Europe, than can be had by any line now in operation, or by any known route.

18. I believe that Hudson's Strait is never frozen over in winter. My reason for this belief is, that the latitude there is too high, and the currents from the tides, &c., too strong, to allow of a general freezing over at any time, and the Esquimaux about the Strait, and about the open water of the Bay, make use of skin boats and canoes, or kyaks, for ordinary hunting and travelling purposes in winter. And during a residence of thirteen years amongst them, I never once heard of any Esquimaux crossing Hudson's Strait on the ice.

19. No. They are not formed in, nor can they get to either place.

20. The ice formed annually about Hudson's Bay, is generally from 2½ to 3 feet thick, and in many places along the coast is porous, or shaky at all seasons.

21. Were fishing or other stations established about the Islands in Hudson's Bay proper, the Strait and much of the Bay would be available for navigation throughout the year. And to reach—say Churchill Port on the Mainland—five months at least of each summer could be utilized for such a purpose.

22. I have never heard decidedly who first proposed the Hudson's Bay route. The idea first occurred to myself in 1858.

23. No. Fewer than on any known route of travel during the last 250 years.

24. I am not, but believe it to be lower than it is on any other known line of travel—and believe the Hudson's Bay Company do not insure at all now, they deeming the route so safe as not to call for it.

25. I know the date of arrival and departure of the Hudson's Bay Company's ships at both Moose and York Factories for twenty years—also the time of arrival and departure of a number of vessels at Little Whale River, on the east coast of the Bay. I kept no record of such dates—but know the times of incoming and outgoing within a few days.

26. Yes; I was in Hudson's Bay at the time, and from a passenger who was on board one of the vessels at the time of the disaster, learned the reason why both ships went ashore.

27. No. Much less so than the great lakes.

28. There is no correct chart or map of Hudson's Bay in existence; but the Bay is from 1,000 to 1,200 miles in length; its greatest width being from 600 to 700 miles. A survey of the Bay is necessary to get at its real area.

29. The shores of Hudson's Bay proper is generally bold and rocky; in some districts the country rises into hills of considerable altitude. In the immediate vicinity of the sea, the land is useless for any agricultural purpose, but is rich in a great variety of minerals. The shore of James Bay is generally low and sandy, with a good deal of marshy land, with none of it fit for farming purposes.

30. Hudson's Strait is bold and rocky throughout, the southern side being generally more elevated than the northern. I believe that very little is yet known about the country on either side of the Strait.

31. Frost remains pemanently in the ground at certain points on the coast. Whether this is general or not, I do not know. I never heard anything on this subject as regards the Strait.

32. I had few opportunities of testing the temperature of the water of Hudson's Bay in July, August and September, but have every reason to believe it to be much the same as that of Lake Superior at the same dates. In the month of August, 1866, I found the temperature of the Bay, while travelling by schooner from Great Whale River to Moose Factory, ranging from 29° to 42° of Fahrenheit. The temperature was greatly affected by locality, being higher, near the land and about islands, than out in the open sea.

33. The waters of Hudson's Bay are the home of innumerable seals and Arctic or white whales, that might be profitably fished and hunted. Many of the rivers and passages about Hudson Bay proper, and some of the great islands there, abound in salmon and other valuable fish, of superior quality, where great industries might be established. Cod, herring and other edible fish are also to be had in Hudson's Bay. The country around the Bay is now the best fur producing region in the Dominion—has game, such as wild fowl of all sorts, reindeer or caribou, &c., &c., in such profusion as seems inexhaustible. And the coast generally, particularly the east coast, holds nearly all the known minerals; many of them, apparently, in unlimited quantity, and spread over such a great extent of country as would render this one of the most extensive mineral regions in the world.

The coast of James Bay proper contains some valuable minerals on its eastern shore, particularly iron ore, in great quantity and abundance; gypsum about the Moose River in any quantity. And at no great distance in the interior, particularly about the Moose, Abitibbi and other rivers, are great areas of land, equal in quality to any about the Great Lakes, with a climate very similar to that about County Huron on Lake Huron. There is also vast quantities of good merchantable timber, such as spruce, white and red pine, &c., in the country between James Bay and the Great Lakes.

38. From what I have observed of the ice movements in Hudson's Bay, during the summers I passed there, I am perfectly assured that an ordinary iron screw steamer would never have any difficulty in getting through what is usually met in Hudson's Bay and Straits. One, and the chief reason, why the old sailing vessels of the Hudson's Bay

Company often met with detention in the ice, was, and now is, that at the season when the floe ice is met with, there is, generally, very little wind, and sailing vessels are, consequently, helpless among the ice, as they would be, in the absence of a breeze, in the centre of the Atlantic. Although we have no useful or reliable chart of Hudson's Bay, it has always been found of easy access to a careful navigator, and has been the scene of fewer disasters to shipping, during the past two centuries, than than any other known sea, where an equal number of vessels were employed.

The ice formed in Hudson's and James Bays during each winter, is only about the shore—very variable in extent—and so inconsiderable in quantity as to be of small consequence, when compared with the whole area of the Bays, and I think it more than probable that little or none of this ice ever finds its way to the Strait, but gets broken up and dispersed by the action of the tides and winds about the islands and shores in the near vicinity of where it was formed. In Hudson's Strait the only ice ever met with comes from Fox Channel and other inlets of the northern shore, and the drift ice would be of little inconvenience to a steamer that kept close along the same coast, as the bulk of the ice in question is impelled by the current across the Stait, much of it being run directly into Ungava Bay.

From what is now known, and the experience already had on the subject, there is every reason to believe that were Hudson's Bay thoroughly surveyed, it would be found one of the safest of known seas. And I have no doubt, that if the present inquiry as to the navigability and resources of Hudson's Bay, is properly conducted and carried out, the result will be of inestimable value to the Dominion generally, and prove the practicability of the one thing that is now an absolute necessty to the very existence, as well as the complete development of Manitoba and the whole of this North-West country—a Hudson's Bay route.

WALTER DICKSON.

LIST OF THE LABRADOR FISHES.

GEOLOGICAL SURVEY, OTTAWA, 21st March, 1884.

SIR,—When I was before your Committee a short time ago, I mentioned that I had written to Professor Baird, Director of the United States National Museum, requesting all the information he could give us, as to the food fishes of Hudson's Strait and Bay.

I have received from him a letter and descriptive list by Dr. Bean (Curator of the Department of Fishes) of the "Fishes of Economic Value obtained by Mr. Lucien M. Turner in Labrador," with special reference to the subject you have under investigation. Mr. Turner has been stationed for two years on Ungava Bay, in Hudson's Strait, as agent of the United States National Museum.

As soon as I received these valuable papers, which I have now the honour of transmitting to you, I wrote to Professor Baird, thanking him and also Dr. Bean, on behalf of your Committee as well as of myself, for their kindness in so promptly preparing and forwarding the desired list. I presume there will be no charge for this service, and I trust you will find these contributions to this important subject worth embodying in the Report of your Committee.

I have the honour to be, Sir, your obedient servant,

ROBERT BELL.

JOSEPH ROYAL, Esq., M.P.,
Chairman of Select Committee on Hudson's Bay, Ottawa.

Letter from Tarleton H. Bean, M.D., transmitting "List of the Fishes of Economic Value obtained in Labrador by Lucien M. Turner," and forwarded by Professor Baird to Dr. R. Bell, Geological Survey, Ottawa.

UNITED STATES NATIONAL MUSEUM,
WASHINGTON, 6th March, 1884

SIR,—At your request I have prepared a few notes upon the Labrador economic fishes sent down by Mr. Turner for Dr. Bell, of the Geological Survey of Canada. Mr. Turner forwarded upwards of twenty-five species, of which twelve are useful to man. The salmonoids are especially rich and promise valuable fisheries. Doubtless all of the species occur in tributaries of Hudson's Bay, and many more besides. Other fishes not yet received from Mr. Turner, but certain to exist in northern Labrador, are the capelin (*mallotus villosus*) and the sea herring (*clupea harengus*). The halibut, also, is believed to penetrate Hudson's Bay for at least a short distance, and the cod is sure to enter.

If the proposed exploration takes place, it will undoubtedly reveal many interesting species, some of which, I trust, will be presented to the National Museum.

Very respectfully yours,

TARLETON H. BEAN,
Curator of the Department of Fishes.

Prof. SPENCER F. BAIRD,
Director, United States National Museum.

LIST OF THE FISHES OF ECONOMIC VALUE OBTAINED IN LABRADOR BY LUCIEN M. TURNER.

1. *Pleuronectes glaber* (storer) gill.—The smooth plaice.—A marine species growing to 14 inches in length. There is good reason to believe that it extends into the Arctic, Richardson having recorded it under the name *pleuronectes glacialis*, from Bathurst Inlet, where the true *glacialis*, unless it is circumpolar, does not occur. The smooth plaice ranges southward to Cape Cod, spawning in December and January in shallow bays. We see it frequently in Washington markets among the flat fishes.

2. *Pleuronectes Americanus* (Walbaum.)—The common flounder.—A marine species whose northward range has been extended to Labrador by Mr. Turner's explorations; it is abundant there. The southern limit of the species is not established; but we get it here from the mouth of the Potomac, in company with alewives, mud shad and white perch, at this time of the year. It is larger than the smooth plaice and is abundant, especially northward. The number sold is enormous.

3. *Boreogadus saida* (Lepech) Bean.—Polar cod.—A small, but very important, species, seldom exceeding 12 inches in length. It is common to the two shores of Arctic America; in Alaska, extending to St. Michael's, and in the Atlantic, to northern Labrador. To the natives it is invaluable, because of its abundance and its excellence.

4. *Gadus ogac* (Richardson.)—Greenland cod.—This has by many been considered as merely a variety of the common cod, but it can always be recognized by certain peculiarities. It is very abundant in the Arctic, and ranges to southern Labrador, at least. The examples sent to us from Greenland, Cumberland Gulf and Labrador are smaller than the average of the common cod, but exceedingly plump and healthy in appearance.

5. *Lota maculosa* (Le S.) Rich.—Burbot; *La loche.*—A fresh-water species, abounding in rivers and lakes. Present in Hudson's Bay tributaries; never occurring in salt water. It spawns in February. The roe, when well bruised and mixed with a little flour, can be baked into very good biscuits. The liver is considered a delicacy. The rest of the fish is not esteemed in the Great Lake region and northward, but in rivers of Montana the burbot is in great favour. It grows to 5 feet in length.

6. *Ammodytes Americanus* (DeKay.)—Sand Launce; lant very abundant; valuable as food for cod and other economic species.

7. *Coregonus Labradoricus* (Rich.)—Musquaw River white-fish, abundant in Labrador. A valuable food-fish, reaching 18 inches in length. It is found also in the Great Lake region, in Adirondack and White Mountain Lakes, preferring cold, clear water. Mr. Turner sent down numerous examples.

8. *Salmo salar* (L.)—Atlantic salmon, plentiful and in splendid condition. The value of this salmon is so well known that I need not say more about the beauty of the Labrador specimens and the possibilities of important fisheries for this species.

9. *Salvelinus namaycush* (Walb.) Goode—Salmon-trout; lake trout; namaycush. This is a very large and important member of the salmon family, frequently growing to a length of 40 inches. It forms the object of a very important fishery in the Great Lakes. It is voracious, and, as a consequence, a ready biter. It spawns in the fall, and then retires to deep water. In the fur countries it is caught with cod hooks baited with suckers, on lines put through holes in the ice.

10. *Salvelinus fontinalis* (Mitch.) Gill and Jor.—Brook Trout. Exceedingly abundant and reaching a large size. In the sea-run condition it could be extensively salted, just as the red-spotted char of the Pacific coast is salted at Kodiek and elsewhere. In the brooks, judging from Mr. Turner's great number of specimens, it is sufficiently common to charm the most indifferent angler.

11. *Salvelinus hudsonicus* (Suckley).—Labrador Trout. This is very abundant and reaches 12 to 15 pounds in weight. It is similar to the the last, but has larger scales, more numerous gill-rakers, and the coloration is different.

12. *Catostomus teres* (Mitch.) Subsp.—Sucker. Found only in freshwater. Useful as bait and, though bony, it has some value for food.

FOURTH REPORT

OF THE

HOUSE OF COMMONS DEBATES.

COMMITTEE ROOM, THURSDAY, 20th March, 1884.

The Select Committee, appointed to supervise the Official Reports of the Debates of this House during the present Session, beg leave to present the following as their Fourth Report:—

Your Committee have had before them an application from the members of the Official Reporting Staff (copy of which is hereto appended), respecting the remuneration they receive for their services, and have, after carefully considering the same, decided to recommend that, commencing with next Session, the salaries of the members of the Official Reporting Staff be $2,000 per annum.

All of which is respectfully submitted.

THOS. WHITE, *Chairman.*

To the Chairman and Members of the Select Committee appointed to supervise the Debates.

The undersigned members of the Official Reporting Staff of the House, respectfully submit:

That towards the close of the Session of 1880-81, in a report which was printed in the Journals, we showed that by every fair comparison available in our case, the salaries paid us were wholly inadequate.

In 1882 we made another report, in which we re-stated the facts to the Committee as reasons why we would be paid salaries of at least $2,000 per Session.

After receiving that report the Committee recommended and the House resolved that the salaries of the reporters be fixed as at present.

In renewing our application we beg to state that the sum of $2,000 per Session is simply the lowest amount which would ensure us against loss by the retention of our present positions.

The grounds upon which we ask the Committee for an advance are:

(1.) That we were given clearly to understand, when we accepted our present positions, that if the new scheme proved to be a success we should be *well paid*. The new scheme has admittedly been a success, yet we remain, as stated in our first report, the worst paid officers of the House and the worst paid official stenographers in either Canada or the United States. The appended statement of facts and figures, from official and other sources, abundantly proves the correctness of this assertion.

(2.) That without unduly magnifying the special attainments, long experience and political and general information required of the staff, we would simply remind the Committee that it took eight years' careful selection to secure an efficient *corps* of reporters and establish *The Debates* on a basis satisfactory to the Committee and the House. During that period stenographers who held first-class positions in both England and the United States were tried and found inefficient as *Debates* reporters. Further, the service is peculiar, inasmuch as it admits of no grading, no apprenticeship. To enter it, a man must not only be in a general way a first-class reporter,

master of his profession, but he must be specially and intimately acquainted with Canadian politics. On the other hand, he has no promotion to hope for.

(3.) It is, perhaps, hardly necessary to point out that our work is of a character commonly described as "skilled," or "expert," and bears no comparison whatever with ordinary clerical or departmental work. Yet we find that such officers as Clerks of Committees, Translators, Clerks of Votes and Proceedings, Journal Clerks, &c., are paid salaries varying from $1,500 to $1,800 per session. It is unnecessary to enter into a comparison between the arduous and exacting nature of our work and the merely routine character of theirs.

(4.) Experience has confirmed our former contention, that practically the salaries paid us are annual salaries. Even when we submit to the humiliation of peddling out our services where we may, during the recess, the odd jobs which only some of us thus secure are casual, uncertain and poorly paid. We are compelled to relinquish all hope of professional advancement, and, by reason of our sessional engagements, the means by which we might supplement our salaries are drifting more and more into other channels. It is a fact known to members of the Committee, that one of the very few men in Canada really competent for the work we perform has steadily declined to accept a position on the staff, when vacancies occurred, finding it more to his interest to retain his present position on the press.

(5.) The work is of such an exceptional character that even the slightest impairment of nervous energy is fatal to its continuance. The working life of a professional stenographer is, compared with that of most persons occupying positions in the public service, a very short one. As a rule, the career of a really efficient reporter is confined to the years of his vigorous manhood. We submit that it is not fair to ask us to spend our best days in working for Parliament for less incomes than we might receive from other employers.

In brief, we rest our case on these facts: That we are not earning the incomes that are open to us in other fields; that several of our number have, within the past year, refused better positions, pecuniary, than those they now occupy, and that we have all along firmly believed that the Committee and the House, if they really entered into the merits of our case, would not allow us to remain in our present unfair positions.

LAW REPORTING.

We annex statements, showing the salaries earned by law stenographers in Ontario and the United States, for a class of work of a much lower grade than that of Parliamentary reporting.

In Ontario the incomes of court reporters, including salaries, fees and receipts from special examinations, &c., amount to from $1,800 to $2,500.

From papers read at the New York State Stenographers' Association for the years 1879 to 1882, and at the International Shorthand Association, the following table has been compiled, showing the salaries (including, in most cases, fees and travelling allowances), at present prevailing, or provided for by recent Statutes, in those of the United States and territories in which official court reporters have been appointed:—

Alabama	$2,300
Arizona	3,000
Indiana	2,000 to $2,500
Louisiana	1,800
Maryland	2,500 to 3,000
Massachusetts	2,000 to 2,500
Michigan	2,000 to 2,500
Minnesota	2,000 to 2,400
Missouri	1,800
Nebraska	2,000 to 3,000
Nevada	3,000
New York	2,000 to 2,500

Pennsylvania	2,000
South Carolina	2,500 to 3,000
Wisconsin	2,000
Wyoming	2,500 to 3,500

For the Federal courts of the United States, a Bill was introduced in Congress in 1882, providing for salaries of $2,500 and fees of 10 cents per folio—equivalent to, at least, $3,000.

STATE LEGISLATIVE REPORTING.

None of the American States has a regularly organized system of official reporting in its Legislature. With reference to the New York Legislature, however, Messrs. Rodgers and Ruso, law reporters, Albany, write:—

"The New York Legislature has a reporter in the Senate, and one in the Assembly, each of whom receives $1,500 per Session for taking notes, and 10 cents per folio for such speeches as members desire copies of. I should add that the official stenographers of our Legislature regard the place as of little value, except as a wedge to secure Committees of investigation, for which the pay is 20 cents a folio. Last winter we controlled all but one Committee—a small one of $150 only—and got out some 4,500 or 5,000 printed pages."

This would be equivalent to at least 18,000 folios, yielding $3,600, in addition to the salaries above mentioned.

CONGRESSIONAL REPORTING.

On this subject we cannot do better than quote a letter from Mr. D. F. Murphy, who has charge of the official reporting of the United States Senate.

"UNITED STATES SENATE,
"WASHINGTON, D.C., January 16th, 1884.

"DEAR SIR,—Prior to 1873, the Congressional Debates were published in the *Daily Globe* and paid for by Congress, the *Globe* reporters being allowed by the proprietors of the paper $4.50 per column for the debates, which allowance was supplemented by an appropriation of $800 yearly to five reporters in each House, from the Treasury.

"When the *Globe* was discontinued, and the Debates were ordered to be printed at the Government Printing Office in the present form of the *Congressional Record*, the compensation to be paid was fixed by taking an average of the amounts actually paid for the six preceding years and making it a round sum. In consequence of this, $25,000 a year is allowed for the reporting of each House. The House of Representatives divides this among five official reporters, giving each a salary of $5,000, out of which each reporter provides all the assistance he needs, some having two, others three amanuenses. The Senate pays its total to its official reporter, and requires him to furnish all the assistance in the way of reporters and amanuenses required to do the work promptly; and what this involves you may infer, when told that last session the daily sittings of the Senate averaged more than seven hours.

"The Sessions of Congress last one year, from December till such time as the two Houses agree to adjourn, hardly ever before July, sometimes late in August, and the alternate year till 4th March, with constant liability to extra Sessions, which often occur, and for which no extra compensation is allowed.

"Yours truly,

"D. F. MURPHY, *Official Reporter, U.S. Senate.*"

With reference to the cost of amanuenses, Mr. T. F. Shuey, one of the reporters of the House of Representatives, states:—

"The House reporters employ, on an average, two amenuenses each, at a cost of probably $1,000 a year for both."

This leaves the net salary of each reporter $4,000. This figure is just double what we are asking from Parliament. Yet, a careful comparison shows that United States Civil Service incomes are only about 30 per cent. in excess of those paid in Canada, while the salaries paid by the State Governments rule very much lower than those in the Dominion.

As to the expense of the official report, we would point out that the entire cost of reporting, printing editions in two languages, translating, binding, &c., barely exceeds in the aggregate the sum paid for reporting alone in the House of Representatives at Washington.

It must be evident to the Committee, from the above consideration, that the permanency of the staff—the most essential factor in the success of the new system—can only be guaranteed by placing their salaries on the basis which we have shown to be fair and just.

We desire to express our willingness to meet the wishes of the Committee, in case they should think it desirable to adopt some scheme whereby our services might be placed at the disposal of the Government for a portion of the recess, for especial, official, shorthand work, such as commissions, enquiries, Dominion election trails, &c.; thus practically placing our employment as well as our salaries on an annual basis.

We believe that no objection can be raised against our case that cannot be successfully removed, and we would respectfully suggest that in case any further explanations be deemed necessary, a committee of the staff be permitted to confer with the Committee.

All of which is respectfully submitted.

G. B. BRADLEY, *Chief Reporter.*
GEO. EYVEL,
ALBERT HORTON,
S. A. ABBOTT,
E. J. DUGGAN.
F. R. MARCEAU.
J. O. MARCEAU.
THOS. JNO. RICHARDSON.

DEBATES OFFICE, HOUSE OF COMMONS, 7th February, 1884.

FIFTH AND SEVENTH REPORTS

OF THE JOINT COMMITTEE ON PRINTING.

COMMITTEE ROOM, 21st March, 1884.

The Joint Committee of both Houses on the Printing of Parliament, beg leave to submit as their Fifth Report, the Report of their Sub-Committee (hereto appended) "appointed to enquire as to the best method of performing the Printing Services in future," which having adopted, they respectfully recommend for the consideration of both Houses.

All of which is respectfully submitted,

THOMAS WHITE, *Chairman.*

COMMITTEE ROOM, 21st March, 1884.

The Sub-Committee appointed to enquire as to the best method of performing the Printing Services in future, beg leave to submit the following as their Report:—

Your Committee have had under consideration the subject of the best method of carrying on the Public Printing, namely:—Whether by the establishment of a Government Printing Office, where all the printing and binding of Parliament and of the Public Departments could be performed, or by contract, as heretofore.

They have obtained a Statement (Appendix No. 1) from Mr. Robert Romaine, who was for many years Superintendent of the Queen's Printing Office, under the late Messrs. Derbishire and Desbarats, and a letter (Appendix No. 2) from Mr. S. P. Rounds, the United States Public Printer, which are hereto appended. They have also examined Mr. Gliddon, of the Queen's Printer's Office, as to the manner in which the Departmental printing is now carried on, that is the prices paid for special work, and the manner of measurement adopted in checking and auditing the accounts of the Public Contractors and others, performing printing for the Government.

They append statements of the cost of the Public Printing for the last four years, both that done for the Departments (Appendix No. 3) and for Parliament (Appendix No. 4), and they are of opinion that the sum of two hundred thousand dollars may be regarded as the minimum cost per annum in the future, of the Public Printing and Binding including the Departmental and Parliamentary work, and the Printing of the Official Debates of the Senate and the House of Commons.

Your Committee have not been able to obtain such information as would enable them to make a positive recommendation on this important subject. Such information as they have obtained points to this result: that, by means of a Government Printing Office, under the superintendence of an experienced man, the printing would be done about as cheaply, and certainly better, than by the Contract system; and they have formed this opinion on the belief that with the Public Printing, under the control of an efficient superintendent, whose interest and duty it would be to economise, the duplication and the spacing out of matter, which now obtains in the Public Reports, adding to their size as well as to their cost, would be avoided.

Your Committee, however, as already stated, do not venture upon a positive recommendation. They believe the subject is one which should be thoroughly enquired into before a final decision is arrived at, and with the view of permitting that enquiry to be made they would recommend that in accordance with the provision contained in the present Contracts, by which Parliament has the right to extend the same for five years, they be extended for the present for one year, from 31st December next, and further thereafter if found necessary, to which extension the several Contractors have signified their consent in writing.

All which is respectfully submitted,

THOMAS WHITE, *Chairman, Sub-Committee.*

APPENDIX No. 1.

REPORT.

To the Sub-Committee of the Joint Committee on Printing;—

GENTLEMEN,—In compliance with your instructions dated 6th February, 1884, to report as to the best method of performing the Printing Services of Parliament for the future, the probable cost of such an office as would be capable of performing all the Departmental and Parliamentary work, that is, the cost of the building, the necessary plant, &c., the cost of working, and a comparison as to the work performed in a public printing office as compared with the present contract system, I have the honour to submit the following Report:—

In all my experience as a practical printer, well acquainted with all the Departmental and Parliamentary Printing and Binding, not only as apprentice and conductor of the late Messrs. Derbishire & Desbarats' Queen's Printing Office, but the actual organizer, in detail, of all the printing plant and machinery in that establishment; and being the first printer in Canada to introduce steam printing in 1844, I am convinced the contract system has not been a success, either to the Government or to the contractors, for the following reasons among many others I could mention:—

1ST. WORKMANSHIP.

By the wording of the printing contracts it has been evident the Government desired to have first-class workmanship. In this they certainly have not succeeded, as can be readily verified by comparing the Canadian Public Documents with those we exchange with other countries. Nor is it likely we ever will under the contract system.

2ND. ECONOMY.

If the Government desired economy in the price of composition and press work, they have also failed to obtain their desire, because the contractors will, invariably, in order to make the low-priced composition remunerate them, have to blank or space out the matter from 20 to 40 per cent. thereby adding to the number of tokens of presswork, besides adding to the quantity of paper to be supplied by the Government and also the extra number of volumes of the Sessionals to be bound, which, if allowed to go on at the rate of the last ten years, will necessitate the Government providing more storage and shelving. As to the increased expense in forwarding by mail this extra and unnecessary weight of matter I have no means of ascertaining.

3RD. DEBATES CONTRACT.

With regard to the English Debates Contract, I think it ought to pay well at 60c. per M., and all alterations being paid for extra. Especially so will this be this Session, now that copy is supplied from the Type Writers, punctuated and capitalized, before being sent to the printers. The French Debates ought also to pay if any kind of readable copy is supplied and alterations paid for, seeing it is principally day work.

4TH. DEPARTMENTAL JOB WORK.

It is a well known fact that the last two or three Government contracts for printing have been more profitable than those preceding, on account of the large and gradually increasing Departmental job work. And it is in this class of work that a well-managed Government Printing Bureau would produce the greatest economy, as well as the best service and workmanship. With a suitable building, a portion of which could be set apart for storage of printing and fine job papers, advantage could be taken of the slack time to strike off the needed supplies of all permanent and standard jobs for the several Departments, especially those of the Customs and Post Office Departments. Then, again, a large portion of the jobs requiring heavy editions

might remain in store till called for, and if found convenient, might be wrapped, packed, addressed and shipped direct from the Printing Bureau to the place of destination, by means of the present staff appointed for that purpose, saving time, double handling and the expense of cartage, first inwards and then outwards, relieving thereby some of the now overcrowded rooms in several of the Departments.

5TH. EXCESSIVE HANDLING AND CARTAGE—THE WANT OF STORAGE.

To illustrate the economic results that would be certain to follow in having the storage immediately alongside the Printing Office, under the one roof, take for instance, the tons weight of Parliamentary matter to be mailed by the House of Commons and Bureau of Agriculture, every heavy parcel of which could, at least, be wrapped in covers by the same hands that folded and stitched them, and be ready when required for the proper parties to ship direct to their place of destination, saving several handlings, cartage and time.

The foregoing merely refers to the Parliamentary matter after it has been printed and received by the Senate, House of Commons, the Bureau of Agriculture or any of the other Departments previous to its being mailed or otherwise distributed. I will now describe the round-about method the annual 115 tons weight of Printing Paper takes before it reaches the hands of the Printing Contractor and Binder, and then afterwards delivered to the Departments alluded to.

It is first received at the station, carted to the east or west end of the Parliamentary Buildings, unloaded off the carter's vehicle and loaded on to a tramway truck and run into one or other of two vaults consigned for its reception, under the Chambers of the Senate and House of Commons respectively. Then it is again unloaded from the tram-truck and carried, in single bundles of 104 pounds each, into the vaults, piled up, checked as to quantity and quality by the Clerk of Stationery and then delivered by him on requisitions from the printer, in quantities of 50 bundles or 200 reams at a time, having to go through a similar process of handling and carting as already mentioned. The cartage from the station to the Parliamentary Buildings is paid for by the contractor for the supply of the paper, and costs $4.16 per hundred bundles, or at the rate of $1 per load, but the cartage from the vaults to the printer is paid for through the Contingent Fund of the House of Commons, at the same rate of $4.16 per 100 bundles.

The expense of returning these 115 tons of double royal and double cap printing paper to the several Departments and House of Commons, after it has been struck off in printed sheets, is not so easily computed as that just mentioned for receiving it from the station, because fire proof storage must be had, and is insisted upon by the Government, to store the sheets until the several documents, in the act of being printed are completed and ready to be stitched into Blue Books, or bound as Sessional Papers. It is computed that about one-third of the bulk or weight of the 115 tons of paper is returned direct to the House of Commons Distribution Department for daily requirements, the other two-thirds being carted back daily to vaults under the Library of the House, tied up in small bundles.

The next process the printing paper takes is to be again carted back from the vaults, one portion,—the Blue Book sheets to the printer to be stitched and covered,—the other, the Sessional sheets, to the bookbinder, the both to be dealt with in delivering back again as already explained. These printed sheets are certainly not improved in appearance after so much handling and carting. This last expense of handling and carting these 115 tons of paper has to be borne by the contractors of both the printing and binding and is no doubt a heavy item to be deducted from the profits of doing the work by contract.

6TH. BUILDING.

Having resided in London and other parts of England off and on for nine years, in Paris for seven or eight months, and worked for a season in one of the best book and job offices in New York, and having met and discussed in these places, with some of the best Master Printers, about the best methods of laying out and organizing large

printing and bookbinding establishments, I have no hesitation in stating that a great deal more reliable work, contentment, respect for their overseers, and orderly conduct, can be had from a body of employees in a large and permanent printing office, well lighted, ventilated and clean, than there could be had from, what is now very common, a crowded and filthy office.

A Government Printing Bureau, therefore, ought to be located in an open space, capable of being added to if required hereafter. It ought to be two stories high having a good basement and attic, built of stone and lined with brick, having an air space to dispense with furring and lathing, and be plastered on the brick; it ought to be 60 feet wide and about 150 feet long, divided longitudinally in the centre and transversely into three compartments by brick walls; the basement to be divided into three compartments longitudinally, the centre one—the narrowest—being appropriated to the steam heating apparatus. The six compartments having their dividing walls built up above the roof would render them fire-proof from each other, with the aid of fire-proof doors for communication.

This building being divided longitudinally, one-half facing the north, would be devoted to the Printing Department, and the other half facing the south, devoted to the storage of all the printing and job paper; and the Blue Books and Sessional volumes would also be stored here until finally mailed or otherwise distributed. The press-room, with all its machinery, the job and making-up departments, with the stereotype room, would be located on the ground floor, preventing any noise or bustle reaching the second floor, where would be located the composing-room, proof-reading or any other offices. There ought to be four fire-proof staircases, all built outside the main walls of the building, one at each end and one at each side about the middle, all being extended at their ends, to accommodate the water closets or dry-earth system if approved of. Each side of the building would have its hoist or elevator located at one side of the staircase, no openings or staircases to be allowed from one floor to the other inside the main walls of the building, from basement to attic, the communication to be had only by way of the outside staircases, so that in the event of a fire taking place in any one of the eighteen rooms of 30 x 50 ft., an easy exit for the employees to escape by would be constantly present from basement to attic.

Looking to the very probable increased demand in the near future for storage, printing, and lithographing accommodation, and the absolute necessity of its being located in close proximity to the Parliamentary, the East and West Departmental Buildings, as well as to the Post Office and Custom House, I know of no open space so admirably adapted for a site as the south end of Major's Hill Park, with its broad Park Avenue on the east side, by which all the traffic required to or from could be be had. Starting from the south end of the Park, say 300 or 400 ft., along the avenue, the Printing Bureau ought to be placed the most northerly, in order that if at any future time the Government thought it advisable to stretch a light steel angle lattice girder bridge across the Rideau Canal, the building would then be very convenient for the transit of parcels, messengers, &c., besides being out of the thoroughfare of the City; it would also have perfect immunity from fire from outside causes.

A building of the dimensions given, of plain but substantial stone work, having very little wood work inside, good strong floors deafened between the joists and wood-sheeted ceilings, would cost in the vicinity of $50,000, and the printing plant complete, to do the present wants, about $50,000.

7TH. FUTURE METHOD OF PERFORMING THE SERVICE.

The foregoing relates principally to the immediate necessity for a Government Printing Bureau, namely, cleaner press-work and better composition—more storage room for the Sessional documents and the unprinted paper, less expense and labour in handling both the printed and unprinted paper, and lastly the size and class of building and where it ought to be located.

Although the reasons thus far put forward are considered quite sufficient to warrant the establishment of a Government Printing Bureau, still very much yet remains to be said in favour of the undertaking, if time permitted to do so, in order to enable me to consult some of the Deputy Heads of Departments in regard to condensing some of the Departmental Reports. I believe, however, I am justified in stating that information is given in the Trade and Navigation Returns that is repeated in the Public Accounts, and some information is given in the latter that is also given in the Auditor-General's Report. A Government printer interested in doing his duty, no doubt would naturally remedy this if permitted to do so. It would be his duty to see that official printed matter would not be repeated two or more times in the public documents unnecessarily. The fact is, a Government printing contractor cannot have the interest of the Government at heart, but is working all his might and main in the contrary direction to make the most he can out of his contract, knowing full well he has, while his contract lasts, to recoup himself for the large capital invested in his printing plant, not being at all certain he will be awarded the next contract.

I will now place a few facts before your Committee in relation to the inside management and organization of what a Government Printing Bureau ought to be. The first and most important necessity is that the Government printer should be a practical printer, acquainted if possible, with both the French and English languages. One acquainted, if possible, not only with Government printing but with commercial printing also, in order, that, in purchasing printing material for daily consumption, he may be enabled to go into the market and be a match to cope with the keen wholesale merchant, or his assistant, the commercial traveller. He ought to have been a Master Printer and therefore accustomed to command a body of men, and avert any attempt at discontent or actual strikes amongst the employees. When I speak of a practical printer I do not mean a mere newspaper type-setter, but a printer who has served his five or six years apprenticeship to the business in all its details, one who as a boy has learned to wash an ink table and dry it from all moisture, and who can readily detect when a roller, after being washed and sponged, has lug enough to make good distribution; who when he becomes an older apprentice can put a job to press, make a good impression, who before he has completed his time will be well acquainted with book and job work. Such a printer, after he has travelled and worked as journeyman in other towns or cities, need not hesitate to start business on his own account, other things being equal. Such a Master Printer can not be hood-winked or cheated by his foremen, journeymen and apprentices, as has often been the case with some of the printing contractors. The really few permanent journeymen and apprentices requisite as a reliable staff for a Printing Bureau could, without difficulty, be trained in the manner mentioned.

Another important fact and one that would have to be gradually remedied, is the manner in which the printer has always been supplied with copy for the Departmental Reports. He has at least a dozen masters to please in the proof reading, who are, as a rule, not experienced in that line of business, and who have no fixed ideas as to uniformity or style of typography. The result is, the foreman printer and compositor are allowed to space and blank out as they please.

With regard to the documents laid on the Tables of the Senate and House of Commons, and ordered to be printed, the blanking out practice is largely curtailed, as has been often shown and explained by me to several of the members of the Printing Committee for these last three Sessions. Before the copy is sent down to the printer we examine it thoroughly, take out all duplicate and useless matter, condense and mark all head and date lines, signatures and addresses as close in as possible. But still all we can do and threaten we are often checkmated after we return our first galley proof, by several little dodges, as spacing out a few lines at the end of a few paragraphs in order to gain a few lines and thereby a page in making up a form. This blanking out practice in contract Government printing is a very old one, and I cannot see any remedy but for the Government to do their own printing, and

I have no doubt this may be as easily accomplished, as when several years since, the Government became their own importers of stationery.

After a careful study of not only the desirability, but the absolute necessity there is for the establishment of a Government Printing Bureau I have arrived at the following conclusions :—

1st. That for the reasons set forth in the foregoing, a saving of at least 25 per cent. can be had in the quantity of paper, press-work and book-binding—especially now, as five copies of the Debates are ordered for the members instead of three, as formerly.

2nd. That taking the nominal prices now paid the contractor for the composition of Parliamentary and Departmental job work, I do not consider them excessive at all, but taken in conjunction with the facts stated in regard to the bad workmanship and blanking out system, then I do consider the prices excessive, because the contract is not honestly carried out, nor ever will be under any contract that can be written.

3rd. That taking the amount now paid under the contract system annually, I firmly believe that the whole cost of the plant and building of a Government Bureau would be recouped in five years.

4th. That irrespective of the profit and loss involved in the contract system of printing, there still remains the question of the absolute necessity for more storage room, as set forth under the head of storage and excessive handling and carting.

Debates.

In the former part of my Report I have alluded to the Debates contract paying well. I have not seen the contract, and only base my opinion upon the price per mille ems, and the hearsay arrangement that all "alterations" are to be paid for "extra." It would, therefore, be advisable to have Mr. Boyce, the proof reader of the Debates, brought before your Committee, to find out what is meant by the word "alterations"—is it merely the natural corrections in first proofs for first edition, or is it alterations in the speeches made by the members for the second edition? Then again who is it decides and examines these "extra" charges? Is it Mr. Boyce, who is a practical English printer, or is it left to the discretion of the contractor.

Departmental Job Work.

On application to the Postmaster-General and the Minister of Customs, I have obtained a complete set of forms, very well classified, from both Departments, the former numbering about 800 and the latter about 400. It would be impossible, in a written report, to give a correct or adequate idea of the extent and variety of these jobs. Mr. Gliddon, who is also a practical printer, in the Department of the Queen's Printer, ought also to be called before your Committee and state as to the several prices paid, how often these jobs are put to press and paid for as new composition, faint lining, binding, &c., and whether the indorses are paid for as full pages or not, as they are in the case of the Parliamentary printing.

There are several questions of importance alluded to in my Report, which, in a technical sense, could be more clearly explained and described when accompanied by the documents themselves, both printed and unprinted. For this reason I would like to be permitted to appear before your Committee also, and give what information you may think necessary in furtherance of your views for the establishment of a permanent Printing Bureau, an establishment that would be a credit to this great and rapidly increasing Dominion of Canada.

I have the honour to be, Gentlemen, your obedient servant,

ROBERT ROMAINE,
Proof Reader, English, and Clerk of Stationery.

House of Commons,
12th February, 1884.

APPENDIX No. 2.

OFFICE OF PUBLIC PRINTER,
WASHINGTON, D.C., 9th February, 1884.

DEAR SIR,—I have the honour to acknowledge the receipt of your communication of the 6th instant; and I regret to say that it comes just at a time when every hour of my time is taken up with pressing official duties, and which will at this time prevent my giving you any details, figures or estimates. But I will send you by this mail a copy of my last Report to Congress, which will give you much information about the working of this office. I can say that for many years the work of this Government was done on the contract system and it gave so much trouble and was so expensive that Congress determined to establish this office; and the change has been *a very beneficial one.* Not only is the work done much cheaper, *but far more promptly and satisfactorily* than ever before, and I have no doubt but that you would have the same experience should you establish a Government office. With a proper and careful selection of modern machinery, type and material, good workmen, and care in the purchase of stock, &c., there is no reason why the Government should not save all the profits that are earned in the regular business, as conducted by private parties.

Should your Parliament decide to establish a Government Office, I have no doubt that with my life-long experience as a Printer and a manufacturer of printing materials, added to my experience as Public Printer, I might be able to be of some service, and I would be very glad to render any such aid in my power.

I have the honour to be, very respectfully yours,
S. P. ROUNDS,
United States Public Printer.

HENRY HARTNEY, Esq.,
Clerk, Printing of Parliament, Ottawa, Canada.

APPENDIX No. 3.

RETURN of Printing, &c., as per Accounts audited in the Office of the Queen's Printer, for the years 1880, 1881, 1882 and 1883.

——	1880.	1881	1882.	1883.	Total.
	$ cts	$ cts.	$ cts.	$ cts.	$ cts.
Departmental Printing	34,994 02	34,483 24	34,317 74	41,340 23	145,135 23
Statutes	1,440 63	992 81	1,567 53	1,880 78	5,881 75
Criminal Law	49 15	411 25	.....	.....	460 40
Canada Gazette	1,683 04	1,638 85	2,240 65	2,232 69	7,795 23
Departmental Reports	12,949 25	8,721 16	13,875 03	11,043 39	46,588 83
Printing—outside Contract	18,373 21	15,864 75	40,964 74	42,245 61	117,448 31
Lithographing	894 70	1,731 38	2,116 75	2,794 90	7,537 73
Total Printing	70,384 00	63,843 44	95,082 44	101,537 60	330,847 48
Departmental Binding	15,943 94	18,697 29	17,557 01	24,335 02	76,533 26
Binding Statutes	3,481 99	3,395 68	3,441 71	3,413 47	13,732 85
" Criminal Law	.....	632 00	.....	.....	632 00

B. CHAMBERLIN, *Queen's Printer.*

APPENDIX No. 4.

PARLIAMENTARY PRINTING.

COST of the Printing, Binding and Lithographing performed for Parliament, for the years, 1880, 1881, 1882 and 1883. Also, the printing of the Debates of the Senate and House of Commons.

——	1880.	1881.	1882.	1883.	Total.
	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
Printing	49,589 18	46,346 09	36,482 55	32,822 56	165,240 38
Binding	4,520 60	3,016 83	4,296 20	2,196 20	14,029 83
Lithographing	1,303 50	421 85	671 70	540 50	2,937 55
DEBATES—					
Senate—Printing and Binding, say	2,250 00	2,250 00	2,250 00	2,250 00	9,000 00
House of Commons—					
Printing	5,295 18	7,854 35	7,923 40	10,473 70	31,546 63
Binding	750 00	1,425 00	712 50	1,350 00	4,237 50
Totals	63,708 46	61,314 12	52,336 35	49,632 96	226,991 89

HENRY HARTNEY,
Clerk, Printing of Parliament.

COMMITTEE ROOM, 2nd April, 1884.

The Joint Committee of both Houses on the Printing of Parliament beg leave to submit as their Seventh Report. The Report of the Sub-Committee appointed to Audit the Printing Accounts and for other purposes, together with the Report of the Clerk of the Committee on the Printing services of the past year, and the Parliamentary Printing Account; Annual Statement from the 1st July, 1882, to the 30th June, 1883, all hereto annexed; which being adopted, they respectfully recommend for the consideration of both Houses.

Also appended to this Report will be found applications from Mr. Romaine and Mr. Sloane (Appendices A and B), in charge of the Stationery and Proof-reading Department of the House of Commons, for a yearly allowance for certain services performed, as set forth in a document hereto also appended (Appendix C), entitled "Office duties of the Stationery and Proof-reading Department," for which services the Committee would recommend $300 per annum to Mr. Romaine and $200 per annum to Mr. Sloane—such payments to date from 1st January last.

THOMAS WHITE, *Chairman.*

COMMITTEE ROOM, 28th March, 1884.

The Sub-Committee of the Joint Committee on the Printing of Parliament, to whom was referred the auditing of the Printing Accounts for the past year, and other references, beg leave to report as follows:—

That they have carefully examined the Annual Statement of the Parliamentary Printing Accounts for the fiscal year from 1st July, 1882, to the 30th June, 1883, and compared the several items of expenditure with the vouchers connected therewith, and found all the entries correct, and being thus satisfied with the correctness of the accounts, they have certified accordingly—and have signed.

On the reference to the Sub-Committee as to the appointment of an additional Messenger in the Distribution Office, they would respectfully recommend that John Wiltshire be so appointed at the same rate of remuneration as the other Messengers.

On the reference to the Sub-Committee of the letter of Mr. Romaine applying for remuneration for extra proof reading and preparing Index during the past Recess, they would recommend that the sum of $100 be granted for that purpose, to be paid to Mr. Romaine and his Assistant.

All which is respectfully submitted,

THOMAS WHITE, *Chairman.*

COMMITTEE ROOM, 29th January, 1884.

To the Chairman and Members of the Joint Committee on Printing:—

GENTLEMEN,—I beg to submit the Annual Statement of the Receipts and Expenditure on account of the Printing of Parliament, for the fiscal year ending 30th June, 1883. It is certified to by the Auditor General, and signed by him, as being correct.

During the Recess the several services have been performed in the usual manner; but I must again respectfully draw attention to the crowded state of the Distribution Office. The space being so very limited that it is impossible for the Employés to perform the necessary work with safety, or with satisfaction to themselves, or those whom they serve. Action was taken by the Committee in this matter last Session, but no practical result has as yet followed.

I received notice from the Deputy Minister of Finance, requiring me to send in the Estimates for the printing of Parliament for next year; and also, whether a Supplementary would be required for this year. As the quantity of work performed during the first six months of the present fiscal year was much larger than usual, and estimating the cost of the present Session by that of the preceding one, I thought it advisable, in reply, to ask that $20,000 be placed on the Supplementary Estimates for this year, and $70,000 on the Estimates for next year, subject to the approval of the Committee.

On the 31st December next the present contracts for the Printing, Binding and the supply of Printing Paper, will expire,—it is therefore necessary to make immediate provision for the future performance of those services. The contracts however contain the following provision: "With the right nevertheless to the said "party of the second part, or his successors in office, at the option and by the direc- "tion of the two Houses of Parliament of Canada, to continue the contracts during "the further period of five years, from the day last aforesaid," that is, from the 31st day of December, 1884.

All which is respectfully submitted.

HENRY HARTNEY,
Clerk, Joint Committee on Printing.

DR. PARLIAMENTARY PRINTING ACCOUNT—Annual Statement, from 1st July, 1882, to 30th June, 1883. CR.

—	——	$ cts.	Vouchers No.	——	$ cts.
1883.					
July 1...	To Appropriation, Parliamentary Printing, Letters of Credit issued	60,000 00	1	By Printing, the 20 p.c. retained from last account....	5,392 56
	To Letters of Credit, Departmental Reports, Refunds.....	11,043 39		do to 31st December, 1882, in full.....	10,962 46
	To amount received for the Printing of Private Bills, House of Commons	593 51		do to 1st July, 1883 ..... $31,208 95 Less 20 p.c. retained..... 6,241 79	24,967 16
			2	Binding	2,858 20
			3	Printing Paper	15,361 48
			4	Lithographing	1,752 50
			5	Insurance	82 50
			6	Salaries	3,950 00
			7	Postage	164 83
			8	Miscellaneous	229 77
			9	Superannuation Premium	63 00
			10	Extra copies Geological Survey	2,083 04
			11	Manilla Papers	709 20
				Total cost	68,576 70
				By undrawn Balance of Appropriation, including refund for printing Private Bills ...	3,060 20
		$71,636 90			$71,636 90

HENRY HARTNEY,
Clerk, Printing of Parliament.

The above Statement of Receipts and Payments is correct.

J. L. McDOUGALL,
Auditor-General.

PARLIAMENTARY PRINTING ACCOUNT—Annual Statement, Etc.—*Continued.*

MEMO.

To Balance of Paper on hand—		Expenditure, as above	$68,576 70
1,691 Rms. of Royal, at 2.52½	$4,269 78	REFUNDS:	
36·18 Rms. of Foolscap, at 97½	36 00	Departmental Reports $11,043 39	
	$4,305 78	Private Bills Printing 593 51	
			$11,636 90
		Total cost, Parliamentary Printing.	$56,939 80
		Numerically calculated, the cost for each House will stand thus :	
		The Senate	$15,223 48
		The House of Commons	41,716 32
			$56,939 80

COMMITTEE ROOM, 30th June, 1883.

Examined and found correct.

THOS. WHITE,
J. SIMPSON.
JAMES TROW,
ALPH. DESJARDINS.

(A)

STATIONERY AND PROOF-READING DEPARTMENT,

OTTAWA, 2nd April, 1884.

To the Joint Committee of both Houses on the Printing of Parliament:

GENTLEMEN,—The enclosed letter and statement of the duties performed annually in my office, clearly set forth the justice of my application for a yearly allowance for myself and Assistant, commensurate with the work done for your Committee. I have from time to time brought this matter before your Sub-Committee on Printing, but no action has been taken further than passing the following Resolution:—

Resolved, That this Sub-Committee having examined the arrangements made by Mr. Romaine in the Stationery room, express their cordial approval of the system which he has introduced into all the details of his department, by which a large saving has been made in expenditure and better facilities afforded for meeting the wants of the Members of the House of Commons.

John Charlton, | *G. W. Ross,*
Alph. Desjardins, | *R. Stephenson.*

I have the honour to be, Gentlemen, yours very respectfully,
ROBT. ROMAINE, *Proof-reader, etc.*

(B.)

STATIONERY AND PROOF-READING DEPARTMENT,
OTTAWA, 2nd April, 1884.

To the Joint Committee of both Houses on the Printing of Parliament:

GENTLEMEN,—Mr. Romaine having read me his application to your Honourable Committee, asking an annual allowance on account of work performed for your Committee in this Office, I, on the same grounds, place my application in your hands, trusting it will receive your favourable consideration. I have been for the last seven years employed in this Office.

I have the honour to be, Gentlemen, your obedient servant,
ALEX. SLOANE, *Assistant Proof-reader, etc.*

(C.)

OFFICE DUTIES OF THE STATIONERY AND PROOF-READING DEPARTMENT.

The Office during the Session is kept open from 9:30 a.m. to 11 or 12 p.m. (except from 6 to 7:30 for tea) for the delivery of stationery to the several Committees, Members, Reporters and Officers of the House. During the Recess we often remain in the Office till 6 p.m. to push forward the proof-reading. We took exactly five months after the close of the last Session to finish the proof-reading of the Sessional Papers.

Stationery Department.

(1). Stock has to be taken by the end of June to ascertain what has been issued the past year and what will be required for the following Session.

(2). To make out the orders for Stationery required for the ensuing year.

(3). The new stock begins to arrive from England about the middle of September and ends about the middle of January, and generally consists of upwards of 200 cases, which have to be unpacked, invoices checked, the contents sorted and placed on the shelves.

(4). As soon as sufficient stationery is received, the work of packing the Members' and Reporters' trunks is commenced; this year they numbered 250 in all.

(5). Deliver the stationery, as it may be required, to the Members, the Committees, the Officers, and Extra Clerks of the House, etc., and keep accounts of the quantity.

(6). Keep a Stock-Book of all the stationery delivered, of that on hand, and that to be ordered, with the cost price.

(7). To count out the paper and prepare for the binder and printer the annual blank books, blank printed forms, circulars, tickets required by the several Offices of the House.

(8). A good deal of time is taken up attending to the Hansard Staff (English and French) giving practical instructions to the binder and printer, and making small purchases of stationery in the city during the Session and Recess; requisitions having to be given and accounts for the same certified before payment.

Proof-Reading Department.

(1). To receive all Returns ordered to be printed by the Printing Committee, examine their paging, cull out duplicate matter, shorten the signatures, date-lines, titles, etc., and keep a memorandum of the number of pages of manuscript expunged.

(2). Read and revise the proofs of Documents required during the Session, as well as proofs of Sessional Papers and Appendix to the Journals, as soon as possible, so as not to detain the Printer from putting to press. There are also several miscellaneous jobs to be read for the Officers of the House during the year.

(3). A Register is kept of the dates of all Sessional Papers received from the Clerk of Printing, when they are sent, when the first proof is received, and final revise is returned to the Printer, in which is also entered the number of manuscript pages, maps, etc., contained in each document, and whether extra copies are ordered or not.

(4). We keep also a Register of the Proofs and first and second Revises received and returned to the Printer.

(5). The collating of the 28 Volumes of English and French Sessional Papers was not completed till the latter end of October last.

(6). Prepare during, and in time for the close of the Session, the Numercial and Alphabetical Indexes for the Sessional Papers.

(7). To receive from the Contractor, during the year, about 8,500 reams (or 11 car-loads) of printing paper, check it as to quantity, quality and weight, see it stowed away into the vaults, and then after deliver it in small quantities to the Printer and Binder as required.

REPORT

OF THE

SELECT COMMITTEE APPOINTED BY THE HOUSE OF COMMONS

TO OBTAIN INFORMATION

AS TO THE

AGRICULTURAL INTERESTS

OF

CANADA.

Printed by Order of Parliament.

OTTAWA:
PRINTED BY MACLEAN ROGER & CO., WELLINGTON STREET.
1884.

THE ENCOURAGEMENT

OF OUR

AGRICULTURAL INDUSTRIES.

HOUSE OF COMMONS, WEDNESDAY, 30th January, 1884.

Resolved,—That a Select Committee composed of:—

Mr. Bain (Wentworth),
" Benoit,
" Fisher,
" Foster,
" Gigault,
Mr. Irvine,
" Landry (Montmagny),
" Massue,
" McDougald, and
" Orton,

be appointed to inquire into the best means of encouraging and developing the Agricultural Industries of Canada, and to report thereon to The House; with power to send for persons, papers and records.

Attest, J. G. BOURINOT,
Clerk of the Commons.

TUESDAY, 19th February, 1884.

Ordered,—That the said Committee have leave to employ a shorthand reporter to take down such evidence as may be necessary.

Attest, J. G. BOURINOT,
Clerk of the Commons.

REPORT.

The Select Committee appointed by the House of Commons to enquire into the best means of encouraging and developing the Agricultural Industries of Canada, beg leave to report that they have made a careful enquiry into the disadvantages and wants experienced by agriculturists, that it was considered could be in any degree removed or supplied, by more extended and attentive action on the part of our Legislature and Executive. For the purpose of this enquiry, the Committee have taken the evidence of persons who have made special studies of the various branches of industry comprised under the more general term agriculture, of others possessed of wide scientific knowledge having a direct and important bearing upon agriculture, of whom some by travel and observation were able to afford the Committee much valuable information of the effect of operations for the encouragement of agriculture in other countries, and of others who, being practical Canadian farmers, were well prepared to express the general feeling as to the wants and disadvantages experienced by agriculturists in Canada. The evidence given by these gentlemen has greatly aided the Committee in forming conclusions that they believe will be found to be perfectly justified by experience elsewhere, and also abounds in information of a nature that renders it well worthy the careful perusal of agriculturists generally throughout the Dominion.

Before taking their evidence the Committee issued a series of questions, a form of which is herewith presented, to agriculturists in all parts of the country, in order to ascertain the views of that class generally.

OTTAWA, February, 1884.

SIR,—A Special Committee has been appointed by Parliament to consider what steps should be taken to place the Department of Agriculture in a position to better promote and encourage the Agricultural Industries of the country. The Committee being anxious to become possessed of the advice and experience of men engaged in the culture of the soil, as well as of those devoted to the study of sciences having a practical bearing on agriculture, begs to solicit your co-operation, and to request that you will express your views on those of the following questions with which you feel prepared to deal. Enclosed is a printed envelope for reply, which the Committee would be pleased to receive at as early a date as possible.

I am, &c., G. A. GIGAULT,
Chairman of Committee.

1. Under what difficulties does the present system of agriculture labor, and in what respect is the Canadian farmer placed at a disadvantage when competing in foreign markets?

2. What deficiencies have come under your notice in the—
   - Cultivation of cereals,
   - Cultivation of roots and grasses,
   - Raising of stock and wool growing,
   - Production of butter and cheese,
   - Culture of fruit,
   - Fertilizers in ordinary use?

3. Would the importation of seed from foreign countries benefit our farmers?

4. Would a general system of inspection and branding be likely to enhance the value of our butter and cheese in the home and foreign markets?

5. Would the importation of fruit tree scions and plants from Russia and other countries under climatic conditions similar to those of Canada, be of service to our fruit growers.

6. Would the appointment of a public analyst, to whom samples of soil and of home manufactured and imported fertilizers might be submitted, prove of advantage to our farmers?

7. Would the establishment of an experimental farm or garden where varieties of foreign grain, fruits, trees and fertilizers might be tested, and whence such seeds, plants, &c., might be distributed throughout the Dominion, be advisable?

8. Have you noticed any appreciable deficiency in the crops of your district owing to the depredations of birds and insects?

9. What crops and fruit products have suffered most, and from what classes of insects or birds?

10. Have any, and what, steps have been taken in your district to keep down insects and birds injurious to vegetation?

11. Can you furnish the Committee any details as to the amount of loss sustained by agriculturists in your locality from bird or insect pests infesting grain, clover, onions, turnips, potatoes, pease, beans, cabbages, tomatoes, squashes, apples, pears, plums, grapes, strawberries, currants, &c.?

12. Have the timber trees in your district suffered from any of these destructive agents?

13. Would the appointment of an Entomologist, whose duty it would be to give information concerning birds and insects (injurious and beneficial) and the means of protecting the crops against their ravages, accomplish any benefit to the farming classes?

14. Would it be desirable to extend the duties of the present system of veterinary inspection of stock in quarantine, and, if needful, the staff also, with the view to deal with the local development of infectious diseases among farm stock and poultry throughout the Dominion, and the best means of stamping them out?

15. Is there in your neighborhood sufficient standing timber to supply shade, fuel and other domestic wants?

16. Have any steps been taken to maintain this supply, or to replant where it has failed?

17. Do you know of any attempts to introduce tree planting for timber purposes, what varieties and area were planted, what were conditions of the soil, what have been the results, and to what do you ascribe the success or failure of those attempts?

18. Would the establishment of a Central Bureau, having for its object the collection of information upon all matters relating to agriculture, and having a skilled staff capable of giving advice, making experiments, and noting the improvements effected in other countries that might might be advantageously introduced into the Dominion, be a benefit to our agriculturists?

19. Would the dissemination of handbooks and reports containing the data thus collected, on culture, stock-raising, dairying, poultry keeping, &c., have a beneficial effect?

20. Would you recommend in this connection the formation of a section devoted to agricultural statistics, showing the acreage under the different corps, the movements and prices of grain, cattle, &c., rates of transportation, fluctuation of foreign markets, &c.? And what advantages might be expected to accrue therefrom to the producer?

21. Would the issue of monthly bulletins and abstracts containing such information be of sufficient advantage to warrant their publication?

22. Does your experience enable you to offer any further suggestions whereby such Central Bureau might be utilized to promote the agricultural interests?

About 1,500 copies of the Series were mailed to addresses furnished on application by members of the House of Commons, to which 385 replies have so far been received. The leading subjects referred to in the answers and evidence are deficiencies in the cultivation of cereals, roots and grasses, stock-raising and wool growing, dairy productions, fruit culture, fertilizers, &c.; importation of seeds, fruit tree scions and plants from countries under climatic conditions similar to ours; the establishment of an experimental farm, the ravages of birds and insects and the appointment of an Entomologist, the establishment of a Central Bureau of Agriculture, with a section devoted especially to statistics recording acreage under crop, movements and prices of produce, rates of transportation and condition of foreign markets, &c.; and the

publication of such information by the frequent issue of bulletins and abstracts, and the dissemination of information on the various branches of agriculture through the medium of handbooks, reports, &c.

An examination of the replies to the questions sent out sustains the view that more thorough agricultural knowledge generally—particularly of the kind of crops most suitable to the various soils and the most economical and efficient methods of production—is the great hindrance to progress in agriculture. This is owing mainly to the absence of sufficient means of information or the difficulty of obtaining it, and in many cases to the neligence of the farmers themselves. The fact must not be overlooked that farmers could derive instruction and suggestions of inestimable value from our excellent agricultural periodicals, were it not for a lack of appreciation of their value and very misdirected notions of economy.

According to the answers received, it appears there is a large amount of defective farming in the country, notwithstanding the great progress made in recent years. In the cultivation of cereals, roots and grasses the chief deficiencies are want of periodical change of seed and its right selection, and proper rotation of crops, with lack of thorough tillage and knowledge of the value and suitability of manures. The value of manures is in many cases overlooked, and much fertilizing power is lost through negligent exposure and the waste of liquid manures. In stock-raising the chief deficiencies are want of more pure-bred males, lack of knowledge of adaptability of breeds to particular conditions throughout the Dominion, want of better pastures and insufficient tree shelter. In the production of butter the milk is frequently not properly cared for, nor is suitable attention paid to the selection of milch cows, and the food given is often deficient in nutriment and milk-producing qualities. Low grades of butter are also very largely attributed to want of skill and scientific knowledge in its manufacture, and want of improved apparatus. In cheese making a want of skill and scientific knowledge is also felt. The quality of rennets is neglected, and proper thought is not given to the suitability of the materials used for packing. Several answers point out that the buildings used for cheese factories are too lightly constructed to afford adequate protection against atmospheric changes. In the cultivation of fruit a great want is experienced, in many sections, of hardier varities and of varities with improved keeping qualities. There is also a deplorable want of knowledge regarding the insects and diseases to whose attacks fruit trees are so much liable. It is believed the fruit industry might be made much more profitable and general by the introduction of other suitable varities, and by a liberal dissemination of information respecting insects and diseases of fruit.

A careful summary has been prepared of the views expressed in the answers upon the most important of the questions submitted, and is given herewith :—

No. of Replies.		Establishment of Experimental Farm.		Appointment of Entomologist.		Establishment of Central Bureau.		Section devoted to Statistics.		Handbooks and Reports, and Issue of Bulletin.	
		For.	Against.	For.	Against.	For.	Against	For.	Against.	For.	Against.
Ontario	169	121	33	85	55	109	32	95	31	100	26
Quebec—(English)	35	20	8	18	10	21	6	20	2	21	4
do (French)	89	68	14	56	24	64	17	41	33	76	8
Nova Scotia	59	46	6	27	21	41	4	35	7	36	8
New Brunswick	25	15	3	10	5	18	3	18	1	18	2
Prince Edward Island	7	7	.....	2	1	3	.....	2	.....	4	.....
Manitoba	0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
British Columbia	1	1	.....	.....	1	.....	.....	.....	.....	.....	.....
Total	385	278	64	198	117	256	62	211	74	255	48

A large proportion of the answers regard the proposal for an experimental farm so favorably as to advise, not only a central one, but branch farms in every Province. The current of opinion, as shown in these replies, is very strong in favor of the Central Bureau and the experimental farm.

The Committee orally examined fourteen witnesses upon various subjects falling within the scope of the enquiry intrusted to them. Their evidence was carefully reported by a shorthand writer, in order to its preservation and publication if the House approves, but it is deemed desirable to emphasize portions of it by a brief review, with occasional extracts from the evidence and the answers to questions already alluded to.

HORTICULTURE.

The fullest evidence on this important branch of agriculture was given by Mr. Charles Gibb, of Albottsford, P.Q., a gentleman who has, perhaps, devoted more attention to fruit culture than any other Canadian. Mr. Gibb has travelled extensively in Europe in search of varieties of fruits suitable to our climate, and has published many works upon both home and foreign fruits. Statements by Mr. Gibb, therefore, carry with them all the influence that experience and knowledge of the subject can furnish Regarding our lack of hardier varieties of fruits in Canada, Mr. Gibb says:—

"We have our drawbacks in the way of fruit culture in the greater part of Canada. We are north of the limits of the successful culture of the fruits of western Europe, and it is only those occasional fruits which have, for some reason or other, some northern blood in them—some northern ancestry—that can be grown in our colder climate, so that we are compelled to go to the old world and to the cold climates of that world for our fruits.

* * * * *

"Q. Do you think there are more varieties of fruits in Russia than here, and that we can increase our variety by importing fruits from Russia?—They are growing the apple there in great quantities. Now, for instance, take the Government of Kazan, 400 miles east of Moscow, 600 miles furter north than this, with the extremes in the matter of climate, a warm summer and dry, steady winter. It is a point to which Crookston or Fergus Falls on this continent would correspond. There we find the apple grown in twelve peasant villages to the value of about $50,000 per annum. The thermometer had been down to 40 degrees below zero the winter before we went there, yet the trees were full of apples. The thermometer had been down to 52 or 56 five years before, and there were no signs of winter killing on those trees. Now the fruits of that region must be of great value to parts of our North-West. I do not want to be too sanguine about the North-West. I hope we can grow fruit there; but we are going to fail in some of our first attempts, because we do not know how to grow it there. As I say, those fruits that are growing in climates so much colder than our own ought to be introduced there. Then, as regards the pear. I saw pear trees at Saratof, where the winter temperature is one degree milder than at Quebec, and they were in good health. Then, when you come to the cherry, in the district of Vladimir, just east of Moscow and a little north of it, where the winter temperature is three degrees lower than it is at Quebec, they grow a cherry in such quantities that full cars of it, and at times entire trains, are shipped. At all events it floods all the markets, and yet the winter temperature of the climate in which it grows is much lower than that of Quebec. That brings up the query whether such fruits should not be introduced into Canada, not for limited trial, but for something more than limited trial, because if we had it, it would lead to another industry, that of canning the fruit, which would be worth having. There are plums grown in those regions of the German prune type, of good quality. At the same time, whether they or an improved variety of the wild plum of the North-West will be the plum of the future for us, is a question. There are still other fruits grown there that we can grow; for instance, take the mulberry. There are mulberries in Mongolia, Central Asia, growing in colder regions than those in which the Russian mulberry is found. There are also

mulberries of fine quality growing in Amur, on the Pacific coast. So that we should increase our area of that fruit. Then we come to the apricot. The apricot is growing on the Altai Mountains, between Turkestan and Southern Siberia, at a high elevation and in a cold climate. * * * Judging by the Russian fruits we have seen and tested, we know we can, in the climate we have, increase the area, northward, of fruit culture on this continent."

Mr. Gibb's evidence is sustained by that of Prof. Penhallow, professor of botany in McGill College, Montreal, a gentleman who also has travelled extensively, who spent some years in Japan, and who has made a close study of fruits and their diseases. Prof. Penhallow says :—

"It is by bringing in from other countries the fruits which are peculiar to them, and which may be adapted to our particular wants here, that we get a greater variety of fruits. Besides, in so doing, we could get fruits which might mature at different seasons, and which would vary in their keeping qualities. The great difficulties where we have not a large range of varieties is, that the fruits mature at the same time, or that their keeping qualities are the same."

Mr. Wm. Saunders, of London, Ont., chemist, President of the Ontario Entomological Society, author of a valuable illustrated work on "Insects injurious to Fruits," and a large orchardist, also says :—

"In the cultivation of apples in the more favored districts of our Dominion, much loss is occasioned in years of plenty from the abundance of autumn-ripening fruits, the markets being glutted. The majority of orchards hitherto planted have contained too large a proportion of such fruits. Farmers need to have this impressed on them. The difficulty may be remedied by top-grafting with winter apples. In the colder sections there is a great want of hardier varieties of all sorts, which will better withstand the severities of the climate. This might be accomplished either by the introduction of hardy varieties from other cold countries, or the production here of new varieties by judicious cross-fertilization and selection. Many of the special fertilizers now sold are frauds, and there are but few where the farmer who purchases them gets value for his money."

We return to the evidence of Mr. Gibb. In reply to the question : "Do you think the Government should establish an experimental station, or an experimental garden ?" he says :—

"Suppose we had something of that kind started here, we would not need more than ten acres of ground, but it would be safe to have ten acres alongside, which we could get if we wanted to make the station twenty acres. Then we would need to import certain trees—some from Russia, some from northern China, and some that we could get from Ames, Iowa. That is, we should import them from cold climates. We should propagate these enough to get them scattered in the country. Then for the experimental orchard we should have three trees of each kind planted in it. That is not an expensive work, and the great beauty of the thing is, that we know now what to import. We are not working in the dark now ; we know what to import, and we know that our work is one of certain success."

The following remarks by Prof. Penhallow, on the subject of diseases in fruit, suggest a highly important and useful work that might be performed by those connected with an experimental fruit garden, as that advocated by Mr. Gibb :—

"The principal difficulty is the want of knowledge of the proper methods of combatting diseases. I may mention incidentally that we have insufficient knowledge in regard to the varieties of fruits which may be adapted to given climates, but principally the deficiencies are to be found in the knowledge of the diseases attacking fruits. While there are many insect depredations, yet the injuries which I principally refer to now would be those arising from the action of vegetable parasites or other diseases introduced by deficiencies in food. This question has of recent years demanded very prominent attention and it has received very careful consideration."

The loss sustained by farmers in many sections of the country by the introduction of unsuitable trees from United States nurseries is particularly mentioned by Mr. Julius L. Inches, Secretary of the New Brunswick Board of Agriculture :—

"Cultivation of fruit is becoming very general in New Brunswick. Great loss was sustained by unsuitable trees from United States nurseries. Home-grown and grafted trees are more successful." Regarding the importation of suitable trees and scions from Russia and other countries under climatic conditions similiar to ours, Mr. Inches says: "The introduction of suitable trees and scions would be very valuable, but each kind should be tried by suitable persons before many are sent through the country. The loss of the trees is as nothing compared with filling the country with poor fruit that people don't like to cut down and are not worth the space and labour of continuing to care for them."

The Committee think the foregoing extracts of great importance as indicating the needs of Canadian horticulturists and the most effective means of supplying those needs. It is hardly necessary to point out that it would be impossible for mere private enterprise to deal with the subject of introduction of new varieties of fruits on such a scale as would meet the necessities of the case. Left to private enterprise alone, progress in fruit culture will necessarily be but gradual.

EXPERIMENTAL FARM.

The question of the establishment of an experimental farm being, in the estimation of the Committee, one of great importance, they have carefully endeavoured, as far as time would permit, to ascertain to what extent such institutions are employed in other countries and how their operations are regarded. In our own country public sentiment appears to be very strongly in favor of the establishment of an experimental farm, with branches in the Provinces, where differences of climate render them advisable, 278 of the replies so far received having favored such action, and only 64 having expressed a contrary opinion. In a report published in France in 1882 as to the merit of experimental farms or stations, in *Le Journal d'Agriculture Pratique*, by Mr. P. Joigneaux, a member of the Agricultural Commission, we find the following words: "Their usefulness can no longer be disputed. The farmers can no more dispense with them than we can dispense with the services of physicians in cases of sickness or of men of law in litigious matters."

In 1868 Mr. L. Grandeau was commissioned by the Minister of Agriculture of France to study on the spot the agricultural stations of Germany, and to address to him a report on the working of these institutions, on the services which they render to the German population and as to the advantage there would be to French agriculture by encouraging the creation of analogous establishments.

When he returned from his missions, Mr. Grandeau thus wrote to *Le Journal d'Agriculture Pratique*:—"Starting for Germany with the idea that there was much to be done in order to impart to French agriculture, by teaching, and with the aid of chemistry, a movement that would produce the happiest results, I found at every step that my convictions on this subject were confirmed, and on returning to France, I was full of admiration, it is no exaggeration to say, for the agricultural institutions of Germany. There, the societies and schools of agriculture and the agricultural stations are in a flourishing condition. Almost all of them are well organized and have at their disposal revenues and subsidies, which enable them to provide abundantly for every requirement. In a word, and why should I not declare it? Beholding those institutions so well advanced, and so effectively patronized by individuals and by the State, I could not help animadverting on what exists among ourselves, or to speak more correctly, on the absence of analogous institutions in our country.

"I was not less painfully affected when I visited the laboratories and experiment fields for agriculture in Germany. There, everywhere life, labour without bustle, but active and productive, essays on every kind of artificial and natural manure, meetings of practical people and learned men, at which are periodically discussed questions suitable to the time. Of all this we know nothing or next to nothing in France. Agricultural societies languish notwithstanding the good will of some of their members. Our agricultural committees limit their operations almost exclusively to the distribution of bounties and medals. There is nothing in all this calculated to impart

to our agriculture a truly fruit-bearing movement. This cannot be changed or modified by the isolated efforts of some learned men and a few practical people. It is necessary, above all, that the great body of agriculturists should be convinced by facts of the extreme importance, to-day more than ever, of cementing the alliance of science with practice. At whatever cost, our farmers must be made familiar with the art of experimenting. In a word, it is henceforth indispensable that agriculture, which in our country has been hitherto exclusively a science of observation, should become, at the same time, an experimental science. At this price and at this price only, can be reached better conclusions which will be more abundantly remunerative, and which will more than compensate the increased labour which the husbandman will undertake in following the new order.

"If the preceding reflections are well founded, and if we are not deluded as to the direction which French agriculture ought to receive, it is no difficult task to reach the conclusions which follow from the principles laid down above. On the one hand must be brought to the knowledge of practical farmers the results of agricultural researches undertaken in laboratories and experiment fields; on the other, it is important, as M. E. Lecouteux recently said, to stimulate immediately the creation of the greatest possible number of experiment fields in agricultural clearings."

At a later date, 20th September, 1877, M. Grandeau wrote to the same journal:—

"The station comprises both a scientific establishment, the value and reputation of which depend on the qualities of the learned man who is at the head of it, and a laboratory, where the proprietors, farmers and manufacturers of the neighborhood go to make, at their own cost, such analyses and researches as they may require.

* * * * * * * *

"Between 1852 and 1860 the German stations were almost all constituted on the same plan. The principal object of the scientific department was to study the nutrition of plants and the influence of manures. An experiment field and a laboratory for analyses constituted the means for study. Not long after the study of animal nutrition took the place which was claimed for it by the importance of cattle in agriculture. Hence the first step towards speciality. Each station continued to make analyses for the public and to carry on the manufacture of manures. But whilst some developed their experiment fields and erected special constructions for the study of the nutrition of vegetables, others applied particularly to animal physiology. A stable for experimenting and respiratory apparatus took the place of the experiment field for the study of soils and manures.

"The two branches of agriculture (cultivation of the land and care of cattle) were, then, in Germany provided with scientific institutions, where the husbandman could obtain information, such as he required, for guiding him in the cultivation of his land.

"The manifest demonstration of the profit resulting to agriculture from the union of chemical science and physiological experiment which was realized at the stations made impression, every day, more and more, on pratical farmers. Their mistrust of those whom they call the learned lessened from day to day, and they hastened to come to ask, at the station, counsel and instruction as to those things in their daily labors on which they most wanted information. From this confidence in science and the new services which it renders to the farmer in enlightening him as to the facts which he observes without being able to explain them, arose the *specialization* of the stations.

* * * * * * * *

"If it be desired to group the several stations now in existence, according to the special services which they render to the practical cultivator, we conclude by classing the establishments in the following manner:—

Direction of Scientific Researches.

Number of stations devoted to these specialities—

Studies on soil in general	16
Essays in culture and manuring (experiment fields)	24

Cultivation of the vine and manufacture of wine	13
Cultivation of fruit	3
Study of forestry	9
Researches in vegetable physiology	28
Diseases of vegetables	11
Researches in animal physiology and feeding of cattle	20
Stations for milk and cheese	11
Accessory agricultural industries	5
Sugar factories	3
Distilleries	2
Breweries	2
Researches in technical chemistry; manufacture of manures; ivory black; tanneries	22

In France in the year 1878, twenty-five experimental stations were subsidized, viz:—

Station of Nice	2,500	francs
" Caen	1,750	"
Laboratory of Cantal	3,500	"
Station of Bourges	1,000	"
" Montpelier	16,467.50	"
" Vincennes	10,000	"
" Grignon	6,000	"

And eighteen other stations which received each an appropriation varying from 500 to 3,000 francs.

Prof. Penhallow, in his evidence, made the following statement in reference to experimental farms in Germany:—

"The first movement which occurred in Germany leading to the establishment of their experiment stations was brought about through the efforts of the farmers themselves. Up till 1850 there were no institutions which were qualified to carry on investigations of a scientific character which could be applied to agriculture. The farmers of certain portions of Germany began to realize that their future success depended very largely upon more exact knowledge, as obtained from scientific research. So in 1852, in Saxony, a local farmers' club organized, by their own efforts and at their own expense, a small experimental station. They placed that in the hands of a University graduate; I believe it was Dr. Wood, who has since given us such valuable results in his scientific work. In two years' time that station had so thoroughly demonstrated its usefulness and its importance that the Government recognized it, and not only recognized it, but extended to it very important pecuniary support. The work of that station, which was then extended, came to be recognized as of great importance to the country at large. Since then, as the results of that early movement, there have been established, within the last thirty years, over eighty of these stations. Nearly all of them receive at least a measure of support from the Government, although many of them are still largely supported by private subscription or local societies. I think it is exceedingly significant, as showing the importance and the value of these stations, that the farmers themselves should initiate the movement, and that it should come from them rather than from the Government.

* * * * *

"These stations have given material which is not only of the highest scientific value, but of the highest value in the direct promotion of agriculture as a science; indeed, we can attribute to their work almost all the exact knowledge we have at the present time concerning the careful breeding, management and feeding of stock, the growth and nutrition of plants, the special requirements of plants, the adaptation of plants to soil, the sources of plant food, and other questions of a similar character, which are exceedingly numerous.

* * * * *

"The knowledge gained in these stations is disseminated by means of annual reports. These reports embrace only the most important portion of the work done; they embrace that which may be regarded as established. In other words, it includes what would be the foundation of laws on different subjects. Aside from those reports, a very large amount of information is distributed also through the medium of bulletins, which are issued at frequent intervals, as material is collected and occasion may demand. But the material which goes into these bulletins is carefully regulated, and nothing is allowed to go into them which should more properly go into the report at the close of the season."

Speaking of experimental farms in Japan, Prof. Penhallow said:—

"In Japan they have no true experiment stations, although they have large experiment farms, which have been established with direct reference to the importation and testing of improved farm machinery, farm stock, and fruit and forest trees. These farms have been established chiefly within the last ten years, and almost entirely in the northern portion of the Empire, in the island of Yeddo, where they have desired to make special efforts in the development of agricultural resources. There have been one or two farms established on the main island, in Tokio and vicinity, but they are more of the nature of farms subordinate to those in the north.

"They have imported large quantities of fruit trees. The number of desirable fruits known to Japan before recent foreign intercourse was exceedingly limited. They established a large garden at Tokio for the testing of importod fruit trees, and from that centre they have distributed fruits, including plums and cherries. Throughout the northern island of Yeddo there are now numerous, and in some cases large orchards, which have been established in this way. Not only that, but they have developed a large area in vineyards and hop culture. There, we have a very direct and valuable outcome of the work which can be performed by these experiment stations, or more properly, in this case, by trial grounds."

Prof. Wm. Brown, C.E., P.L.S., of the Ontario Agricultural College, Guelph, gives the following interesting statement concerning the working of the experimental farm in connection with the College:—

"I shall take up the subject in the order given in your communication:

"'(*a*) Give the Committee your opinion of the results of your experimental farm upon the agricultural and stock-raising interests of Ontario.'

"While it takes more time to evolve anything in farm cropping than in live stock development, this farm, by its ordinary practice, as well as through purely scientific research, has already done considerable for the country. In practice, it has introduced and distributed several new cereals that have stood their time fairly well, and the value of this subject is now more evidenced than it ever has been, by the fact that, with no wheat, oats or barley on hand to recommend, the very numerous applications for them are causing disappointment. So strong has this feeling become that I have just forwarded a recommendation to the Ontario Legislature, of which the following is an extract:—

"'Ontario may have to take a second place in the extensive and cheap production of cereals, because the possession of the country westward being in some respects a repetition of our own life, will produce cheaper, and maintain plant excellence better than older lands can do. This new feature of our Dominion agriculture must be acknowledged in Ontario practice, and that practice made to tie with it. This position does not imply that Ontario must give up her wheat area, or that the proper maintenance of varieties must be abandoned. I think on the contrary, that it devolves on us more than ever, to give attention to these. Under the increasing fertility of our older lands, by the better system of farming, and larger number of live stock kept per acre, Ontario is as able as ever to grow perfect wheat, both winter and spring varieties. The fine old Soule and Fife have left us meantime—not for want of proper nourishment in climate or soil, but simply, because in the regular course of their day, as cultivated plants, they require a change. We did not allow them that thorough recuperation, by change to other climates and soils, which alone affords new life, and hence serious disappointments and loss are too often charged to

other causes. It comes as an interesting point in these considerations, whether our North-West Territories will send us back the Fife, Club and White Russian, so invigorated as to give us another lease of a quarter of a century. Meantime, something else must be done.

"It is considered to be the duty of the Legislature, in connection with this experimental station, to maintain a system of grain testing, for ourselves, as well as for others. I am of opinion that Ontario, by all her physical conditions, is better adapted for this purpose than any other position on the American continent. European and United States experience says, that the change of seed most suitable for them and us is from Southern Russia and Hungary, which have a climate in more respects resembling Canada than any other country. The isothermal of 45° joins Ontario and the Black Sea district, which is still so famous for sound wheats.

"A good deal has been attempted during the last ten years, in introducing new wheats from the United States, both by private enterprise and this experimental farm, but with few exceptions, they have failed, or were but short lived. This was a natural consequence of *bringing from south to the north.* The work must be accomplished through equal, or no more severe climatic conditions, than the country proposed to be benefited, so that further attempts from the United States may be looked upon as fruitless. We should at once begin the purchase of wheat from Europe, not only for experimental testing here, but immediate distribution throughout the Province. For this purpose, I ask that $3,000 be placed in the Estimates for 1884, and that means may be taken for a proper selection, by a competent person, so that the fall of 1884 and spring of 1885 may be fully provided for, in chosen parts of the Province.

"From this your Committee will realize how much importance is still attached to the proper maintenance of cereals. Then again, this station has very prominently drawn the attention of farmers to the importance of permanent pastures, and by a careful series of trials has now shown what varieties of grass and clover are best for the purpose. The result is that very many, in other Provinces as well as Ontario, have followed our directions, with a most gratifying success. The success has been such as to call forth high commendations at public meetings, and a Senator of the Dominion lately said to the writer, that what the Ontario Experimental Farm had done in this respect goes a long way to cover all its expenses.

"So also in regard to green fodder as aids to pasture, and special lines of feeding. This farm has very distinctly shown what can be done by the average farmer. In the case alone of the clover called Lucerne, we have many followers, who are much satisfied with the results. These, among others, are evidence of what we have done in farm cropping.

"In more pure experimental work our record has been as yet introductory and questioning—the inevitable of all experimental stations with a nine years' histo y only.

"The great question of the times, in Europe especially, is the value of special fertilizers. To this we have devoted more than ordinary attention. The future may show something that is at present undeveloping in our experience, but meantime, I take the position, that the light thrown on our practical tests in the use of apatite, gypsum, and others, in the production of farm crops, goes to establish what might be matter of gratification to the country, that its wonderfully fertile climate, in conjunction with system and the best management and use of farmyard manure, renders the extensive use of special fertilizers comparatively valuless. I am aware that such an opinion will be challenged, and many cases cited in contrary proof, but in this, as in other things, marked exceptions are not wanting.

"In making prominent the stock-raising interests of the country, our farm has not only done more than among crops, and manures, but has actually held the lively interest of the United States, Australia and Europe during the last eight years. This has resulted from:—

"1. Introducing new breeds of cattle not previously known in the Province.

"2. In feeding and fattening their crosses with the common cattle upon sound scientific and practical basis.

"3. In pointing out their special properties and adaptability to particular objects.

"4. In so breeding and feeding the pure-breeds for sale as to command the confidence of the people.

"As the agent of the Ontario Government in this work, I have been highly gratified at the success, and the response thus furnished is but a touch of the immense field open to the Dominion. As part of the same, we have been making careful experimental tests as to the value of many forms of feeding materials; not only with those at home, but others from Europe and the States, so that to date we hold some facts of practical importance in connection with the maintenance of animal life, particularly during our very distinct winters."

Prof. Brown subsequently sent the following letter, embodying an important suggestion:—

"ONTARIO AGRICULTURAL COLLEGE, GUELPH, 9th March, 1884.

"GENTLEMEN,—I beg you will allow this letter to form part of my answer to question (*b*) in reply to yours of the 18th ult., as, on further consideration, I consider the subject a very important one.

"During the last three years, very many young monied men have come from Europe to the Dominion in view to acquiring land—principally for raising fine stock. To prepare themselves for this they have either applied to the Ontario Experimental Farm, or to some good farmer in Ontario. We have refused admission to over eighty during that time, and the facilities with farmers have failed to meet the requirements. It is a fact, at the present moment, that this College could easily be filled with students from England and Scotland alone at a handsome fee.

"Should Canada ignore this, even allowing that several would settle in the United States? The destination of most of these young men is our North-West.

"I beg to suggest, therefore, that your Committee recommend the establishmenp of a farm in a conveniently situate part of the North-West, on a small scale, susceptible of convenient extension at any time, where young men should receive instruction in live stock matters only; where specimens of all the leading breeds of cattle, sheet and horses would be kept for education as well as for sale; where two professors only would be necessary—one as Principal, and teaching all the characteristics and practical handling of live stock, with a veterinary surgeon as assistant.

"I am satisfied that were such a station opened next year, properly advertised, and first-class management employed, not less than *one hundred* applications would be received.

"Allowing as low a fee as $100, irrespective of board, the $10,000 as immediate revenue would surely be encouragement enough, and, of course, the greater *Dominion aim* would be settlement of lands by those well prepared on the speciality.

"Any such enterprise by a company, or an individual, would not secure the confidence, nor possibly the ability, that a Government can.

I have the honor to be, gentleman, your obedient servant,

WM. BROWN.

The Special Agricultural Committee, Ottawa,

Much more information of value respecting experimental stations will be found in the evidence of Mr. Gibb and Mr. Thayne in the appendix, which the growing length of the report prevents making direct extracts from.

The views of the great majority of the replies to the questions sent out, bearing on this subject, are well expressed by the following, selected from the replies of leading individuals:—

Mr. D. W. Beadle, nurseryman, of St. Catharines, Ontario, says:—"Most certainly. I believe Canada is the only British colony that has no botanical garden, and this, in fact, is a standing disgrace to our civilization."

Mr. Julius L. Inches, Secretary of the New Brunswick Board of Agriculture, says:—"I have no hesitation in recommending such a farm, and think it would be

most beneficial. I have recommended that something of the kind should be added to our Government stock farm."

G. Laroque, Esquire, M.D., of Beaumont, P. Q., writes on the subject:—

"The establishment of experimental gardens or farms is not only useful but indispensable to the advancement of agriculture. Under the direction of instructed, able and practical men, these establishments render immense service in all countries where they are to be found."

Rev. M. Choquette, Professor of Chemistry, in the College of St. Hyacinthe, writes, in reply to the questions of the Committee:—

"As to experimental farms or schools, I deem them absolutely necessary to the progress of agriculture. In France, in Belgium and in Denmark, each station has one of these schools: in these schools our authorities in agricultural science and economy have studied, tested and formulated the rules, a careful attention to which has so greatly contributed to the good reputation and prestige of agriculture in those countries. These experimental stations would, above all, be of great assistance to the butter and cheese industry."

P. R. Pelletier, N. P., farmer, of St. Césaire, writes:—

"The establishment of such a farm or garden would be of great benefit to us. I may, in fact, say that it is for us a thing absolutely necessary and essential."

Hon. H. G. Joly, of Quebec, says in answer to question 7:—

"Yes; with good and intelligent management, such a farm would render great service. It is not easy for our farmers to make such experiments, even if they were willing and able to risk them, but they would watch them with much interest and would not be slow in appreciating the results and benefitting by them."

Mr. J. M. Browning, of Longueuil, Vice-President of the Council of Agriculture of the Province of Quebec, says the establishment of an experimental farm is much needed.

Mr. J. M. Fisk, farmer and nurseryman, of Abbottsford, P.Q., says:—"Yes; it is one of the needs our country has felt the want of for some time."

Prof. Buckland, Assistant Commissioner of Agriculture for Ontario, says:—"Experimental farms and gardens in the older Provinces of the Dominion, efficiently conducted, would materially conduce to the advancement of agriculture, horticulture, forestry and ornamental planting."

Mr. Saunders, chemist, public analyst, orchardist, &c., of London, Ont., says:—"Such experimental farms or stations should be established in every Province of the Dominion, but the Dominion Government should have some central establishment, as at Washington, in the United States, where young trees and plants might be grown and sent by mail to be tested in all parts of the Dominion. Such an establishment should be managed by a Council or Board of Managers apart from politics, and have a revenue to support it derived from a donation of public lands for this purpose, as in most of the United States."

Nine prominent gentlemen of Hastings County, Ont., to whom the series of questions had been sent, met and after discussion agreed upon the following answer to question 7:—"Yes; there should be one such farm in each Province."

Mr. Edwin C. Beer, President New Brunswick Farmers' Association, states:—"As the climate, soil, &c., of the different Provinces of the Dominion vary, the establishment of provincial agricultural schools and experimental farms should be encouraged by the Central Government, where such experiments could be carried on with better results. Ontario already has one, and other Provinces will follow, the Maritime Provinces probably uniting."

Mr. C. R. H. Starr, farmer and fruit grower, and Secretary of the Nova Scotia Fruit Growers' Association, replies:—"*Undoubtedly!* If one or more were established in each Province (which would be necessary to ensure satisfactory results)."

Mr. D. B. Newcomb, J.P., member of County Council of Kings County, N.S., says the establishment of an experimental farm would be "most advisable, if pro-

perly conducted, and very desirable. We are strongly in favor of stock farms and experimental farms connected with an agricultural school."

Mr. John Goff, J. P., farmer, of Georgetown, P.E.I., replies:—"Yes; it would enable the public to benefit by the result of the experiments, and where establishments of this kind are not promoted and liberally supported in a great agricultural country, it shows a lack of interest in its prosperity."

Mr. Robert D. McCallum, farmer, of St. Peter's Bay, Kings County, P.E.I., is of opinion that "one such in each of the several Provinces of the Dominion would be of advantage, if managed without allowing the blighting hand of the politician to have a finger in it."

Mr. Alex. C. Anderson, Inspector of Fisheries, Victoria, B.C., replies:—"Decidedly. Any movement in that direction would be, in my opinion, most advantageous."

Answers similar in sentiment to the foregoing might be quoted by the score, but these will suffice to indicate what is evidently the prevailing opinion in all parts of the Dominion.

AGRICULTURAL SCIENCE.

In this connection the following by Prof. Penhallow is very suitable:—

"There is no industry, perhaps, which demands higher and broader qualifications at the present time than that of agriculture, and it is being more fully recogized than ever, that a man to be a successful agriculturist must have a broad grasp of scientific subjects. If a man is to lead in developing industry as a science and he is to take charge of the scientific work of this station, he must possess very high qualifications as a scientist and not as a practical agriculturist. A practical agriculturist, as we understand it at the present day, has no special scientific qualifications. We cannot expect to put a man of that kind into an experimental agricultural station and to bring him up to the necessary qualifications; but if we have an able scientific man, a man of proper scientific ability, he can adapt himself to the wants of the farmers, and the necessities of practical agriculture will come within his grasp. It seems to me that in the appointment of such a man it would be advisable for the Government to seek the advice of the agricultural societies; yet the Government should be careful that they do not exercise too geeat a control in sacrificing scientific attainments to what are called practical attainments. It must be remembered that all the practical part of agriculture is based upon scientific facts—*scientific knowledge*. The first requisite is to obtain exact facts; and then these may be elaborated and adapted to the wants of the practical farmer. But you cannot, in an institution of this kind, carry on practical experimentation which is not based upon scientific accuracy, because the results will be of no permanent value; whereas, if it is done upon a basis of scientific accuracy it will be of permanent as well as of immediate value. The reason why the German institutions are so successful is because they have been in charge of men of the highest scientific attainments, and their work has been strictly scientific in character. It has been adapted to the work of practical farming and the farmers appreciate it. Of course I recognize that a man who is in charge of the Bureau must be a man able to understand the wants of the farming community at large. But at the same time, he must be a man of high scientific attainments—first, because, if he is, he can the more readily grasp the wants of the farmers and appreciate them, and in the second place, because if he is a man of scientific attainments those specialists under him will have respect for what he proposes. I think there is a need here as in the United States, perhaps even more need here than there, for a higher system of education which will qualify the farmer to meet and master the problems which are inevitably bound to be presented to him in the pursuit of his avocation. I do not think that brains are to be considered at a discount in farming any more than in any other pursuit of life."

FOREST CULTURE.

It has too long been the custom of farmers to treat forest trees as enemies, and it is only since in some sections the country has become so nearly denuded of trees that

the public have shown a willingness to give the subject any consideration at all. Its importance has been too long disregarded, and the Committee feel it their duty to warn the public against its continual neglect. The vastly beneficial effects exerted by forests upon the climate, and the fact that forest culture in all countries where it is carried on is one of the most profitable of occupations, should be sufficient to direct more general attention to it. In this connection the Committee have been able to gather some valuable evidence. The following interesting passage is from a speech delivered by Hon. A. S. Paddock, in the United States Senate, on the 10th February, 1879:—

"Agriculture cannot prove enduringly successful, populations cannot be largely multiplied here, although the conditions both of soil and climate are exceptionally favorable to such results, unless the forest areas are increased proportionately, at least, with the increase of the area of agricultural cultivation. Trees are the dominating members of the vegitable kingdom. They are necessary factors in the sum total of those influences which constitute the envirronment of animal life. Trees, by absorbing carbonic acid gas and emitting oxygen, act as agents in rendering the atmosphere life-sustaining. By interposing their foilage between the sun and the earth they serve a useful purpose in sheltering the soil from the heat, and as conductors of heat, in equalizing the atmosphere of the earth and air. By covering the surface of the ground with a layer of leaves and mold they greatly assist in preventing the escape of heat from the soil, this layer of dead matter being still more useful in aborbing the fructifying rains and allowing the water to percolate steadily into the thirsty earth instead of sweeping over its surface, disintegrating and washing it away. As a mechanical shelter, trees play an important part in protecting both the ground and human habitations from cold and destructive winds. By their power of absorbtion the roots of trees take up from the soil and give off through their leaves an amount of moisture which, deducting therefrom the quantity absorbed in turn by the leaves from the air, is sufficient to exercise an important influence in increasing the general humidity of the atmosphere. As an agent in cooling the atmosphere about and above it, and thus increasing the frequency of rains and the amount of precipitation of both rain and dew, the forest subserves a most beneficent purpose. By the protection afforded the soil against the escape of moisture it preserves and tends to make regular and permanent natural springs which are necessary to the maintenance of vegetable life. In protecting the surface of the ground from rapid evaporation of the rains which fall upon it, and providing a spongy covering which rapidily absorbs and distributes these rains, it prevents the disastrous inundations of rivers which too often occur when the surface of the ground offers no obstruction to the onward flow of the rivulets that suddenly feed the main stream with their accumulated waters. The forest, too, guards the soil against abrasion and displacement from torrents and overflows, and thus again exerts its conservative influence for man's good. Moreover, we need trees for the delight they afford, as at once the most majestic, imposing and beautiful of nature's vegetable forms."

Mr. Stewart Thayne, of Ottawa, a gentleman who has made forestry a study, who has visited and is familiar with the management of most of the great European forests, and who represented the Province of Quebec at the American Forestry Congress, was called upon to give evidence, from which the Committee make a number of extracts:—

"It is impossible to study forestry without touching upon its relation to agriculture. Both are intimately connected with each other. The failure of the one, that is, the denudation of a country of its forest trees, means, if not the destruction, at least the greatest possible injury that can be inflicted upon the agriculture of a country. It is not necessary for me, in order to prove this, to go over what has occurred in ancient times, when some of the most fertile regions in the world were converted into wastes. We can see instances of this in modern times, and within the memory of living man. There is an instance in the south of France, where whole districts have been depopulated. This was owing to the fact that the shepherds on the slope of the mountains cut not only the large wood, but all the small wood, for fuel. As a

consequence, the soil was thoroughly exposed to the rain, and the torrents swept the whole surface soil down into the valleys beneath. Not only was the pasture land on the slopes destroyed, but such enormous amounts of soil and such immense rocks and boulders were swept down, that devastation was carried into the fertile valleys below. It is found now that the injury done in those districts can only be repaired at an immense cost.

"In this country it is very important that the woods should be preserved. It is more important, I should imagine, than in the more moderate climates, where you do not meet with the same extremes of heat and cold. If you destroy the vegetable barrier which you have to the north and which breaks the force of the Arctic winds, you expose yourselves to severer storms of cold. Then it is known that where the forests are once removed, the evaporation of the soil is much more rapid than it otherwise would be, and you rush from one extreme of weather to the other. The influence of forests upon the climate of a country is to equalize the temperature, and the point worthy of consideration is the fact that when you destroy the forests of a country you decrease the water supply. Now, for instance, the effect of deforesting the whole of this Ottawa district would be at once to dry up all those small lakes, rivulets and streams that flow into the main river. Of course practical agriculturists can at once understand what effect that would have upon the whole region; it would be simply to render it comparatively worthless for agricultural purposes. * * * Almost all the countries in Europe have suffered more or less from the destruction of forests. Even in those countries where the remaining forests are now maintained in the best state of preservation, there are certain districts that have suffered fearfully. I may mention in this connection Switzerland, Germany, France, Italy and Spain. In Spain, it is almost impossible, at all events it would be the work of centuries, to restore such districts to their former productiveness. The slopes of the southern Sierras, the fertility of which was at one time the admiration of the world, have been entirely denuded; and those who have purchased the land, or the land-owners, will not go to the considerable expense it would involve to reafforest them. The loss sustained every year by floods alone are something enormous, and those floods may be traced to the destruction of the woods on the head-waters of the rivers."

Speaking of the necessity for the rigor of the German forest laws, which go to the extreme of forbidding an owner from cutting his own trees, except with the consent of the Government officer and the neighboring land owners, Mr. Thayne said:—"One reason for this, is the fact that the great rivers of Europe have diminished very considerably. I have not the statistics with me, but rivers which were once navigable for vessels drawing three or four feet of water are now not fit to float a respectable barge. This has caused very serious alarm."

In the following extract Mr. Thayne indicates a line of action that he thinks might advantageously be undertaken by the Government: "The principal point upon which they might take action would be this—they should separate the lands which are known to be unprofitable for agriculture, and devote them exclusively to forestry purposes, or to the production of timber. We have lands of that charactor here. Up the Ottawa, for instance, settlers have been induced to go in and settle on the pine lands. There, after one or two crops, it will take more than the original value of the lands to make them produce again. After three or four crops, at the outside, the thin covering of the soil over the sand becomes utterly exhausted. These pine lands, and all the lands only fitted for the cultivation of pine and spruce, should be set apart for the cultivation of those trees. There are millions and millions of acres in Ontario and Quebec which could be made productive timber districts, but which will never be productive agricultural districts."

BEET ROOT SUGAR INDUSTRY.

An emphatic opinion was expressed by some of the witnesses that the beet root sugar industry was capable of successful prosecution in this country. Notwithstanding the want of success that has attended its introduction into Canada, the reasons urged in its favor seem of sufficient force to warrant a place in this report.

Mr. Gibb, of Abbottsford, stated :—" When we were going through Central Russia, that is, the prairie district of Russia, here and there we would come across a few thousand acres of beets, and in the centre a large factory, with a big chimney, evidently a sugar factory. I understand that all the sugar in Russia, except a little cane sugar in St. Petersburg, is made there. That portion of Russia has about the same climatic conditions as Canada."

Mr. J. X. Perrault, of Montreal, Commissioner for Canada at the Centennial and Paris Exhibitions, in his evidence stated :—" My opinion is that the beet root sugar industry can be made a success in Canada just as it has been in Russia, Germany and elsewhere, where thousands of millions have been produced. I know it has not been a success in Quebec, and why? We called upon farmers who had not grown it before to take an acre apiece. They used the land as it was; it had no previous preparation—no manure or anything—it was common land that was taken in many cases. The farmer went to work first to secure his ordinary crops, and when he had done that he said : 'Now, I am going to plant some beets.' Not having the implements, not having the experience, not giving them sufficient care, the crop did not yield as they would yield if the beet crop was the main crop. It must be the main crop where there is a sugar factory. I am persuaded that with private capital and private farming the cultivation of beet root sugar in Quebec would revolutionize the Province and make us what France has been made, for it is the beet that has saved France.

" If a factory is to succeed in Lower Canada, or anywhere else, the beet root must be the main crop of the party that starts the enterprise; he must have the nucleus of the crop in his own hands in order that there may be a certain number of tons sure for the factory to run upon, and then other parties may be invited to join and help. The moment we have the beet root, then we have the manure; and it is only through the manure that we can quickly improve the agricultural resources of Canada. The question in Lower Canada is the production of manure; it is a costly thing now, while if we grow beets and sell them, and get the refuse, it is equal to selling the beets and keeping them, that is, if the beets are properly treated.

"If we could get that industry started in Lower Canada, where sugar is so much consumed, there is no doubt that the land would double in value as it has done in France. It is only since the introduction of the beet sugar industry into France that the land there has doubled in value, so I think it is an industry which should be fostered by the Government. It is well known that Napoleon offered a reward of a million dollars to the party who should succeed in making sugar out of beets, and that is how the industry was begun. The science is now known everywhere; but still if there was some encouragement given to the person who would start such an industry, the thing would benefit the whole country, and it is admitted that what benefits the whole country should be paid for by the Government of the whole country.

"In the north of Russia the industry is carried on most successfully. In a report on the subject, published in Washington, of which I just spoke, you will find marked the precise location of every factory in Russia, and you will see that there are fifty or sixty factories in the north. It is known that the beet root sugar industry of Russia is the richest in Europe; in fact, the further north the beet root is grown the larger its percentage of sugar."

STOCK-RAISING.

Upon this branch of the enquiry the Committee have been unable, through various causes, to bestow a close examination. It is gratifying, however, to notice the increased attention that has been paid to stock-raising in Canada of recent years, the great dimensions the Canadian cattle trade has assumed, and the growing popularity of Canadian meats in the British market. We give place to the following extract from a letter by Prof. Brown, of the Guelph Agricultural College :—

"The stock-raising and feeding disadvantages are—want of better pasture—such permanent pasture as the Ontario Experimental Farm has shown can be so easily established and maintained, able to keep one and one-fourth cattle beast per acre in

place of three acres of the present stamp being required for one animal; want of better tree shelter; want of more pure-bred males; want of knowledge of adaptability of breeds to particular conditions throughout the Dominion. I am so satisfied of the adaptability of parts of our Dominion to the production of mutton and wool on the large and cheap scale, in the North-West Territories and Eastern Provinces, that in December last I made a specialty of the subject in an address at St. Sohn, N.B.

"No part of the American continent can compete with us in the healthy maintenance of cattle and sheep, and were our farmers alive at the present moment to what is going on in the United States as preparatory to an almost universal bonanza in beef and mutton, they would surely waken up. I see no reason why Canada should not place and hold herself as the sole breeding ground for the United States. The Americans themselves think so; they act upon this belief, and yet we do not seem to see it."

THE DAIRYING INDUSTRY.

The Committee have received some important testimony on the butter and cheese industries. For a convincing illustration of the importance of these industries the Committee feel they cannot do better than quote the entire views of Prof. S. M. Barré, of Quebec, who has visited Denmark and other countries in Europe, to gather information on the processes followed in those countries. Prof. Barré has charge of the Provincial Creamery in his Province, and is a recognized authority on these subjects. He writes:—

(*Translation.*)

PRESENT IMPORTANCE OF THE DAIRY INTEREST IN CANADA.

The dairy industry is now the most productive agricultural industry in the country. It has assumed such proportions within the past few years that the export alone gives to Canada an annual revenue of some $8,000,000. England buys yearly 200,000,000 pounds of butter. During the year ending 30th June, 1883, Canada exported to England 57,672,959 pounds of cheese, and 6,230,173 pounds of butter. This shows that the yield of our dairy products is susceptible of considerable increase.

OF THE BENEFICIAL EFFECTS THE DAIRY INDUSTRY IS DESTINED TO PRODUCE ON AGRICULTURE.

Dairy farming has the effect of increasing the number of stock and, as a consequence, the quantity of manure at the disposal of the farmer. It therefore enables him to manure his land more thoroughly. Moreover, in order to secure an abundance of milk the farmer must have good milch cows, well fed. In order to accomplish this he must improve his stock and his method of cultivation, if they be defective. After a few years the farmer, who was heretofore behind hand, finds himself possessed of an improved farm, a fine herd of cattle and a considerable income, and all this has come about in such a manner that he scarcely perceives the changes which have taken place in his farm and, in fact, in his own habits. Dairy farming thus induces a happy concatenation of causes and effects which come very near solving the great question of the regeneration of agriculture where it is needed.

FAULTS IN OUR CHEESE PRODUCTION.

The chief fault to be found in cheese production in the Province of Quebec is in the packing. (Cause.)—The boxes used are unfit for the purpose. The curing of our cheese is defective at the opening and the end of the dairy season. It is the same during the great heat of summer. (Causes): The cheese factories are too slightly built and not fit to protect the product against atmospheric influences.

REMEDIES.

In order to improve the average quality of our cheese, all that is needed is to impart the knowledge which has been attained in Ontario to a certain number of intelligent cheese makers, and then employ them as instructors or as inspectors of cheese factories where the manufacture is defective.

The diffusion, by means of the press, of the knowledge requisite for the proper manufacture of cheese and the establishment of good factories. It would also be necessary to recommend the manufacture and use of good boxes for packing.

DEFECTS IN OUR BUTTER

1st. Defects in the making by the greater number of our farmers, particularly those who keep only a small number of cows.

Causes.—Want of knowledge and of the time required for the making of this product. The ordinary occupations of a farmer's wife are too numerous and too complex to permit her to devote to butter making, the time, care and attention required. Labour is now too dear to be profitably employed in this way. For these reasons, the making of good butter for export is now nearly impossible on seven-eighths of the farms of Canada.

Remedies.—1st. Diffuse general information on butter making by means of pamphlets, &c. 2nd. Establish public dairies or butter factories.

WANT OF UNIFORMITY IN MAKING.

Causes.—Want of uniformity in the methods adopted and in the principles generally accepted The butter is made by too many persons devoid of experience, who have neither the skill nor the taste requisite for this kind of work.

REMEDIES.

The adoption of methods specially adapted to the wants of the country and the inculcation of a single theory, scientifically examined and practically tested by competent and disinterested men, in an experimental station. 2. The establishment of public dairies or butter factories.

CONCLUSION.

From what precedes, it is easy to see that in order to improve the average quality of our butter, to insure uniformity in production and facilitate immediate shipment to foreign markets, butter factories must be established.

The establishment of butter factories is then the most powerful lever we can make use of to improve and develop the butter industry in Canada.

Hence, it is of the utmost importance to diffuse the information requisite for the establishment of those factories.

In order to establish butter factories, you need skilful and experienced dairy managers, and in order to have the latter, you must form them. They can be trained by establishing dairy schools at various points throughout the country.

In teaching butter making in the dairy schools, you must have a definite theory and methods scientifically studied and practically tested. This can be done only in an experimental dairy station. The establishment of an experimental dairy station, similar in kind to those which exist in large numbers in Europe, is the starting point. The theory studied in the experimental dairy station must be taught in the dairy schools and practised in the factories generally, and the factories will diffuse practical knowledge as to butter making amongst the farmers.

In the last paragraph we have a summary of the organization of a system of theoretical and practical instruction in dairy work similar to that which exists in Denmark. And, as regards butter making, Denmark is certainly in advance of

every other country in the world. We must not lose heart and think that the application of this system will require a long period of time before giving results, for it is not necessary to go over all the ground travelled by the Danes; we need only profit by their experience and apply the knowledge they possess to the special circumstances of this country.

Prof. L. B. Arnold, of Rochester, N.Y., a leading authority in the United States, was examined by the Committee, and a few extracts are made from his evidence:—

"If we take cheese, the obstacles in the way of success are, first, a want of skill on the part of manufacturers, and in the second place a deficiency in the quality of rennets. * * In the preparation of rennets, manufacturers are apt to get it tainted. It will get actually into a state of putrefaction, in which condition it will injure the quality of the cheese vesy materially."

On account of the inferior quality of the butter made, Prof. Arnold estimates the annual loss suffered by Canada at $5,000,000.

Being asked what steps should be taken to disseminate useful information about butter and cheese making, Prof. Arnold said:—"Perhaps as good a way as any is to give personal instructions. There are a good many ways in which the Government might facilitate the spread of the knowledge of the art. Now, in Denmark, the Government supports a professor at the Royal Agricultural College, Copenhagen, and besides his duties as lecturer at the College, he spends a portion of his time every year going about the country, farm to farm. He does it in this way. He sends to some leading farmer and advises him that he will be at his house at a certain time, that he will stay there two weeks and make butter and cheese there, and that all the neighboring dairymen, dairy maids or dairy lads, as the case may be, who want to learn to make butter and cheese, can come there and question him, and see him work practically. In Ontario the Government furnishes money to the dairymen's associations to be expended by them in employing instructors and in other ways to distribute knowledge. Last year there were four instructors employed in giving instructions to cheese makers all summer. Three of them were paid by the Government and one by the convention. In that way they have put ahead the cheese industry very rapidly. * * In Denmark a good deal of attention has been paid to new apparatus for handling milk, cream and butter. The more you can do with machinery the better. Let the thing be done by apparatus rather than by attempting to educate the makers into the intricacies of the art. * * It is more profitable to make creamery butter than dairy butter as a rule."

Mr. W. H. Lynch, of Danville, P.Q., author of a valuable book on "Scientific Butter Making," a large edition of which has been published by the Ontario Government for gratuitous distribution, was also examined. Speaking of the good results of Government assistance to the dairy industry, he said:—"Wherever there has been anything done by the help of the Government, which could not have been done by individuals, the results have been more than commensurate with the cost. In our Province of Quebec, one of the best things the Government has done for sometime, has been, in my opinion, the encouragement of this industry, and the results are observable all over the Province."

Mr. Lynch observed that a great difficulty in the way of provincial aid was lack of means at the disposal of Provincial Governments. "This simply points," he urged, "to the necessity for Dominion action, because where the need may be recognized provincially, it may, for one reason or another, not be carried out. That leads me to this point—that the Dominion can do once for all what each Province would have to do separately, and what each might neglect to do owing to its condition. I cannot speak in too emphatic terms of the importance of the Government doing whatever it can to further agricultural industries—all branches of them; and I think that the general opinion of the farmers will be that the results will be manifold, and the expenditure one of the best that can be made."

Mr. Lynch urged that "precedents for Governmental action were certainly not wanting. Denmark, which now has the acknowledged highest place as a producing country in this line, and has, in consequence, a large export trade, has attained this

position by Government action. For fifty years Denmark has been, through the Government, giving great attention to this important industry. The results are that they now ship butter to warmer climates where other countries find no foothold." He advocated the establishment of a model dairy, which could be visited by those wishing instruction; grants to dairymen's associations; to be visited at their annual meetings, whenever practicable, by properly qualified lecturers or professors to discuss improved methods, &c.; also the publication of short reports of the proceedings of these associations or conventions, and of other information deserving of publication. He estimated the annual loss, through lack of improved methods and knowledge in butter making, to be not less than $5,000,000, the greater part of which he believed could be saved by well-directed Government action.

In a communication to the Committee, Messrs. A. A. Ayer & Co., exporters of butter and cheese, with establishments at both Montreal and New York, state:—"There is a general deficiency in the manufacture of cheese in the Province of Quebec, and in some parts of Ontario, but this is traceable to the rapidity of the growth of the manufacture and, no doubt, as the makers get more experienced they will make better quality, and as the farmers grow wealthy they will be willing to put up better buildings and pay better prices for everything that is used about the factory. The matter requiring immediate and urgent attention is that of better boxes. We do not think the Government is aware of the importance of the manufacture of cheese. We were pleased to note the remarks of Mr. Arnold before your honorable Committee the other day, but Mr. Arnold has by no means stated the whole facts of the case. The total exports of cheese for the last six years from Canada have gone on increasing with wonderful rapidity, until during 1883 over 1,000,000 boxes of cheese, amounting to about $7,500,000, besides nearly $2,000,000 worth of butter, has been sent out of the country. The peculiar situation of Canada, in this cool climate, puts us in the same position as Denmark and Sweden, and leaves it without question that there is no place in the world that can rival us in the production of both butter and cheese. If the Government desires to foster the larger make and better quality of cheese, we would respectfully suggest that it can best be done by employing skilled, practical makers of cheese to go about the country among the factories giving them instructions. This has been done to some extent in Ontario with commendable results, but we think a considerable improvement can be made on the system there and, with no disrespect to Prof. Arnold and men in similar positions, our experience of some twenty years (and permit us to add, that during that time we have been by far the largest exporters of butter and cheese from Canada and, perhaps, from this continent) has led us to believe in the instructions of good, practical makers, who have a well-known reputation and are always successful in making the finest cheese."

INSECT RAVAGES.

The evidence went to show that insufficient efforts are made to prevent ravages by insects, from which enormous loss results yearly. Some witnesses stated that a loss of one-tenth of our agricultural products is caused by insects. The difficulties they impose upon farmers were well expressed by Mr. L. VanCamp, of Bowmanville, Ont., a farmer, one of the delegates from the Dominion Grange, who appeared before the Committee:—

"As for the insect scourge in agriculture, it places the agriculturist in a continual warfare, from the time the frost leaves the soil in the spring until it binds it up again in the fall. During all that time the agriculturist has no leisure. If he wishes to be prosperous he must only take sufficient time to eat his meals and sleep. At other times he must be carrying on a continual warfare with these insects. There is something to attack everything that the farm produces, and if we do not give attention to it, that crop is sure to be a failure."

Mr. James Fletcher, Vice-President of the Entomological Society of Ontario, says:—"Taking the average annual farm produce of Canada at only $200,000,000,

which is the lowest possible estimate, I think the lowest figure at which we can put the injury done by insects is one-tenth of the whole, or $20,000,000."

Mr. Fletcher thinks if more knowledge of entomology were disseminated, the ravages would be lessened. The entomologists in the United States seem to have rendered great service to the agricultural class, and the high value the people of the United States set on their investigations is evidenced by the large sums of money annually voted for their support. He was of opinion, that if a bureau of entomology were organized, the benefits to be derived from it would much more than repay the necessary outlay. As a proof, he drew attention to the fact that all the important insecticides had been discovered by entomologists, and not by accident, but after a great many experiments. Mr. Fletcher laid great stress upon the fact that our most injurious insects were small or inconspicious, and were injurious owing to the fact that the farmers did not recognize them as enemies, so did nothing to prevent their ravages. In many instances, although they suffered from them, they did not know whence the injury originated. Under this head he drew attention to the wheat midge, Hessian fly and particularly the clover seed midge. He was of opinion that all these could be kept away, if there were a state officer to refer to, and whose duty it should be to visit infested localities, and suggest proper remedies. Occasionally the wrong remedies were applied to certain pests, when naturally, failure was the result. To this he attributed much of the want of sympathy among farmers with the work of the entomologist, maintaining that the man who made a special study of injurious insects was certainly better able to combat them than those who know nothing or tery little about them. Farmers would, without taking advice, apply the same remedy for all insects, not considering what its habits were. Every insect had its characteristics. Some attacked the root, some the leaf, and others the fruit, and it was estimated that every plant in America had an average of six insect foes which fed on it. It had been found by Dr. Lintner, the New York State Entomologist, that the apple tree had no less than 176 enemies.

Mr. W. H. Harrington, of Ottawa, memcer of the Entomological Society of Ontario, said: "The farmers could do something to increase the number of beneficial insects, if they knew them; they could refrain, for instance, from killing those that are beneficial * * * * I think it was in 1856 or 1857 that the midge was first introduced into Canada. It was introduced into the United States, from Europe, about the beginning of the present century, and it was very distructive in some parts of the States in 1854. In 1856 and 1857 it did great damage in Ontario. The damage to the wheat, in one of those years, was estimated at $8,000,000. But by the introduction of midge-proof wheat, the damage was lessened and by late years the midge has not been abundant. Mr. Arnold, of Paris, made experiments with midge-proof wheat, by hybridizing wheats. There were certain varieties found which were not touched by the midge, but they produced an inferior grain with a hard cover. By hybridizing them with a wheat producing a good grain, they got midg peroof wheat, which owing to the hardness of the cover, resisted the attacks of the larvæ. In the same way, to a certain extent, the Hessian fly has been dealt with, by getting a grain with a heavier stalk. The Hessian fly feeds in the joints of the stalk above the root; if the stalk is too hard for it, it cannot injure the plant very much. But as regards the Hessian fly, sowing the wheat very late in the fall is perhaps the principal method of dealing with it, as it attacks the fall wheat principally. The eggs are laid just above the root, in the fall, and the larvæ feed on the root and in the stem. By sowing the wheat as late as possible in the fall, it would not grow sufficiently for the fly to do much damage to it."

UNITED STATES AGRICULTURAL DEPARTMENT.

The Committee have pleasure in acknowledging the courtesy of the Hon. Geo. B. Loring, United States Commissioner of Agriculture, in furnishing the Committee with reports and pamphlets from his department. We give his letter:—

"UNITED STATES DEPARTMENT OF AGRICULTURE,
"WASHINGTON D. C., 11th February, 1884.

"SIR,—I have the honor to acknowledge the receipt of your letter of the 2nd inst., desiring a copy of the laws relating to agriculture, and the Act under which this Department is organized, the regulations under which it is governed, &c., together with other information indicating in what respect this Department seems most fruitful of good results.

"I take pleasure in mailing to your address (1) 'Swank's History of the Department,' in which, pages 31 to 33, you will find a copy of the Organic Act, and its phraseology expresses clearly the intent of its framers as to the method deemed best to promote the agricultural interests; while the accompanying statements of the work done up to the date of its issue (1872), will give you the methods adopted for the work and the accruing benefits to that time.

"I mail also (2) a copy of the last annual report of this Department, from which you will learn the progress that has since been made in the work assigned to it, and the additional methods suggested by experience for extending its usefulness.

"And (3) copy of Special Report No 1, being an address before the American Forestry Congress, which will show you what has been done in that direction, and what it is desirable should still be done; (4) Special Report, No. 2, being the proceedings of a convention of agriculturalists held at this Department, from which you can probably glean items of interest to the work on which you are engaged.

"Within the past few years special legislation has been had in reference to the sugar industry, and the present Congress is now engaged upon a Bill for stamping out cattle diseases. Other than these, no recent special legislation on the points of your enquiry, has been approved.

"The work of the Department 'seems most fruitful of good results'—(1) in the dissemination of rare and valuable plants and seeds, which are procured both by purchase and exchange with foreign countries; (2) by communicating to different districts the information obtained from other localities as to soils, methods of cultivation, climatic influences, &c.; and (3) by publishing the results attained in the principal sub-divisions, through their researches and experiments.

"I should be pleased to receive from you a copy of any Bill your Committee may prepare on this subject when it is perfected.

"I have the honor to be, very respectfully, Your obedient servant,

"G. A. GIGAULT, Esq., M.P., "GEORGE B. LOVING, *Commissioner.*"
"Chairman of Committee, Ottawa, Canada."

"Swank's History of the Department" describes in a very interesting manner the growth of the Department from 1836, when the Hon. Henry L. Ellsworth, Commissioner of Patents, inaugurated a system of distribution of seeds and plants obtained through United States Consuls in foreign countries, and in which year a botanical garden was established in Washington. The work continued to grow and measures for the encouragement of agriculture multiplied annually, under the auspices chiefly of the Patent Department, but it was not until 1860 that the Department of Agriculture was formally and permanently organized. Although much had been done, the author considered it fell far short of what should have been done in that direction by the United States Government and, writing in 1872, he used the following language:

"Our commerce and manufactures are of vast importance, but they are of secondary interest when compared with our stake in agriculture. * * * We are distinctively and pre-eminently a nation of farmers, and such we shall undoubtedly remain. The temperate and stimulating climate in our country, the variety of soil and range of latitude and elevation, the rural tastes of our people, and the vast domain yet open to homestead occupancy, combine to assure a continuance of the interest hitherto manifested in agricultural pursuits. It is somewhat strange, therefore, in view of all these facts, that so much attention has been bestowed, from the foundation

of the Government upon the encouragement and improvement of agriculture; stranger still, that any professedly patriotic citizen should ever have given utterance to the sentiment that 'agriculture can take care of itself.'"

Mr. Swank thus speaks of the effect of the statistical work of the Department:—"The annual report of 1863 contained the first attempt that had been made since the days of Ellsworth and Burke to ingraft upon the Census returns the statistics of the yearly progress of the agricultural production. * * * * From that day until this the Department has aided greatly, by the publication of tables of this character, in protecting alike consumers and producers from the exactions of grasping speculators. A Maine farmer once wrote to the Department: 'Your monthly reports give me just the information I have wanted for years. Knowing the supply and demand, I am able to sell at my own price, and we can also forsee what will probably be wanted next year. Give practical farmers facts and let gentlemen of leisure theorize.'"

The following section of the Act of Congress, establishing the Department, defines the duties of the head of the Department:—

"Sec. 3. *And be it farther enacted*, That it shall be the duty of the Commissioner of Agriculture to acquire and preserve in his Department all information concerning agriculture which he can obtain by means of books and correspondence, and by practical and scientific experiments (accurate records of which experiments shall be kept in his office), by the collection of statistics, and by any other appropriate means within his power; to collect, as he may be able, new and valuable seeds and plants; to test, by cultivation, the value of such of them as may require such tests; to propagate such as may be worthy of propagation, and to distribute them among agriculturists. He shall annually make a general report in writing of his acts to the President and to Congress, in which he may recommend the publication of papers forming parts of or accompanying his report, which report shall also contain an account of all moneys received and expended by him. He shall also make special reports on particular subjects whenever required to do so by the President or either House of Congress, or when he shall think the subject in his charge requires it. He shall receive and have charge of all the property of the agricultural division of the Patent Office in the Department of the Interior, including the fixtures and property of the propagating garden. He shall direct and superintend the expenditure of all money appropriated by Congress to the Department and render accounts thereof, and also of all money heretofore appropriated for agriculture and remaining unexpended. And said Commissioner may send and receive through the mails, free of charge, all communications and other matter pertaining to the business of his Department, not exceeding in weight thirty-two ounces."

Congress has been liberal in its grants to the Department of Agriculture.

We notice that in the year ending 30th June, 1882, considerably over $350,000 was expended by that Department. The following are some of the heads of expenditure:—Purchase and distribution of valuable seeds, $79,991; experiments in tea culture, $8,743; experimental garden, $6,968; investigating history of insects, $19,998; investigating diseases of swine, $22,443; reclamation of arid and waste lands, $10,000; report on forestry, $4,941; experiments in manufacture of sugar, $32,333.

The fact that the work of the Department is constantly extending and that the expenditure is growing annually, may be taken as evidence that the people of the United States believe the Department of Agriculture pays.

As a fruit of the policy followed by the Department, many articles are now successfully and profitable grown that were introduced and first experimented on by the Department. The production of other articles has also been largely increased through the effect of discoveries, improved methods and suggestions made by its officers. Within the last few years experiments have been made at considerable expense, with the sorghum sugar cane, the tea plant, and for the encouragement of grape culture and winemaking. Should these experiments prove successful and lead to extensive and lucrative prosecution of the industries connected with the growth of these articles, the cost will be insignificant beside the results. By experiments such as

these the United States Department of Agriculture has already conferred great benefits upon the people.

Mr. Perrault, one of the witnesses examined by the Committee, pointed out that a Canadian Bureau of Agriculture would be able to avail itself of much valuable matter from the annual reports and experiments of the United States Bureau.

PRESENT CANADIAN LEGISLATIVE ACTION.

For the purpose of obtaining authoritative information concerning the nature and extent of the steps taken by the Dominion Government for the encouragement of agriculture, Mr. John Lowe, Secretary of the Department of Agriculture, was called and examined. The following is part of his evidence bearing on this point :—

"Q. Does the law as it at present stands authorize the establishment of an Agricultural Bureau, and the appointment of a Commissioner of Agriculture?

"A. The Act of 1868, constituting the Department of Agriculture, would amply provide for the whole of that. The Act provides that the Minister of Agriculture, for the time being, shall be charged with the execution of laws and Orders in Council, and the direction of all public bodies, officers and servants employed in carrying out such laws. The comprehensiveness of that section, therefore, covers every single point of that question. The first function in the enumeration of its duties is agriculture. There has, however, been no special vote for the general purposes of agriculture. There has been special votes for particular branches: for instance, cattle quarantine and inspection, the gathering of statistics in certain particular cases, and also grants to exhibitions. Hitherto those have comprised the whole functions of the Department in relation to agriculture."

Mr. Lowe proceeded to describe the beneficial results of Government action in preventing the spread of and repressing contagious cattle diseases. He stated :— "The measures which have been taken, and the extreme vigilance with which those measures have been carried out, have preserved this country from all attacks of contagious diseases from the outside, and have done for us what certainly has not been done for the United States, that is to say, they have given us immunity from being placed on the scheduled list in the United Kingdom, the result of which is that our cattle are now freely exported to the United Kingdom. We can send stock cattle over; they are bought at fair prices and fed in the United Kingdom; the value of that is estimated by exporters at the moderate extent of two cents a pound on the whole gross weight, which is certainly an enormous advantage to the farmers of this country, and under the fostering effects of which the cattle trade has increased within three or four years from almost nothing to its present very large proportions."

It is thus seen that the Department of Agriculture, as at present constituted, devotes but a small portion of its efforts to purely agricultural objects. The force of the Department appears to be employed chiefly in connection with the Patent Office, the Census and Immigration, to which work for purely agricultural ends seems to be subordinated. According to Mr. Lowe's evidence, however, the efforts spent in that direction in combatting contagious cattle diseases have produced most gratifying results.

The Committee communicated with the Governments of all the Provinces, asking to be informed of the measures employed by them to encourage agricultural industries. The replies from all, except the Nova Scotia and Quebec Governments (which have omitted to reply up to the present date), will be found in the appendix. It will be seen by referring to them that in the majority of the Provinces not much is done by the respective Governments to further agricultural development. Ontario and Quebec have been more liberally disposed, and the expenditures made in those Provinces have produced excellent results.

CENTRAL BUREAU.

The evidence received by the Committee tends strongly in favour of the establishment of a Central Bureau of Agriculture, the duty of which it would be to

ascertain prevailing methods in other countries—the most successful methods—how they can be adapted to the wants and requirements of this country, to introduce new seeds, plants, trees, &c., found after experiment to be suited for growth in Canada, &c. Strong approval is expressed of the periodical issue of bulletins and of the dissemination of handbooks and reports containing useful information collected by the Bureau on culture, stock-raising, dairying, poultry-keeping, &c. Prof. Brown, of Guelph, in the following, expresses the general sentiment:—

"I am of opinion that were the Government to issue annually a succinct, well-arranged and readable report, on the whole industries of the Dominion, the effect would be felt. It would have to be crisp, semi-entertaining, partly historical, up to time and smart in its issue. Allow me to ask one question: if your Government is now preparing such a digest, in view of the visit of the British Association for the Advancement of Science? If not, we will surely be found wanting. * * I can conceive of no better way of expending $10,000 annually than by the employment of one expert who, quarterly at least, would submit such choice agricultural literature in pamphlet form, not too massive, as would command the confidence of our farmers."

CONCLUSION.

Considering that the proper development of our agricultural resources is indispensable to the upbuilding and maintenance of our national wealth and prosperity, and that all progressive countries are at present making strenuous efforts for the introduction of improved methods of agriculture, your Committee believe that no object is more deserving of the active and generous support of the Federal Government than that of fostering and promoting this great industry, and of prompting, guiding and co-operating with all local and provincial institutions formed for the furtherance of this object. Your Committee, therefore, beg leave to summit the following recommendations:—

That the Government take into earnest and favorable consideration the advisability of establishing a Bureau of Agriculture, and an Experimental Farm in connection therewith.

That this Bureau be formed in connection with and under the supervision of the present Department of Agriculture.

That the objects aimed at in the establishment of such Bureau and Farm be as follows:—

1. To conduct such experiments in the introduction and culture of new varieties of seeds, plants, trees, &c., as will most efficiently aid in the advancement of Canadian agriculture; to institute experiments with regard to the comparative value of fertilizers, the proper testing of seeds as to vitality and purity, and the healthy preservation and productive conditions of plants and animals.

2. To make careful investigation into the origin, distribution and habits of insects injurious and beneficial, and the contagious and other diseases to which animals and plants are subject, in order to arrive at the best method of destroying and counteracting them.

3. To study the qualities of the various breeds of cattle and other domestic animals, with the view of reporting on the best means of improving them; of protecting them from parasites and epidemic diseases, of feeding them for the market, and on the treatment of milch cattle.

4. To initiate and carry out a convenient and comprehensive system of gathering the latest and most useful information, statistical and otherwise.

5. To publish and send to the press and the various agricultural and horticultural societies of the Dominion, at different period of the year, bulletins giving the results of trials made on the Experimental Farm, and whatever other information the Bureau may consider useful, either in the prevention of the ravages of insects and

of contagious diseases among animals, concerning improved methods of culture that have stood test, or for the special advancement of any line of agricultural pursuits.

All of which is respectfully submitted, with the evidence herewith appended.

G. A. GIGAULT, *Chairman.*

Committee Room, Monday, 21st March, 1884.

APPENDIX

TORONTO, 8th February, 1884.

SIR,—I have the honor to acknowledge the receipt of your letter of the 4th inst., relative to legislative encouragement given in Ontario towards developing its agricultural resources.

You will find in the Manual of the Agriculture and Arts Act"—a copy of which I mail to your address—the present state of the law relative to the various societies connected with my Department.

Mechanics' institutes, library associations and the society of artists are under the supervision of the Minister of Education.

I have much pleasure in stating that the agricultural societies, on the whole, continue to do good work. Among so large a number, there are some, of course, that make but slow progress; but few, if any, are retrograding. The old Provincial Association has of late had new life infused into it, and appears to be surely regaining its former usefulness. The Agricultural College and Experimental Farm indicates a steady and healthy growth, and is doing an increasing amount of good to the Province and the Dominion. The Fruit Growers' Association, now including the important subject of forestry, and the Entomological Society continue to increase in popularity and usefulness. The additional efforts made of late in calling public attention to the necessity and advantages of forest culture and preservation are, at least, encouraging. The recently organized Bureau of Industries continues to increase in public favor and practical utility, and I look forward with confidence to the valuable services which it will render to agriculture and commerce. The two Dairymen's Associations have also largely contributed to the development of that important source of agricultural wealth.

I will send you copies of a few of the more recent reports of societies connected with my Department. Those for the year 1883 are in course of being printed.

I shall always be happy to coöperate with the other Provinces and the Dominion Government, as opportunity may arise, towards the procuring for publishing purposes such facts and information of a reliable character as will fairly represent the state and progress of our national agriculture and its cognate industries.

I have the honor to be, Sir, your obedient servant,

A. M. ROSS, *Commissioner of Agriculture.*

CHARLOTTETOWN, P.E.I., 20th February, 1884.

SIR,—In answer to your communication of the 4th inst., I have the honor to state that there are no Acts passed by the Legislature of this Province respecting agriculture or for its encouragement, except the following, viz.:—

An Act to regulate the management of the Government Stock Farm, 44 Vic., cap. 9. The Domestic Animals Act, 1873, with its amendments. An Act respecting Dogs (1881). An Act to prevent the spread of the Potato Bug (1883). Copies of all the above I have mailed to your address. There is no Bureau of Agriculture in or for the Province.

Your obedient servant,

ARTHUR NEWBERY, *Assistant Provincial Secretary.*

VICTORIA, B. C., 21st February, 1884.

SIR.—I am in receipt of your letter of the 4th inst., and hasten to say, in reply, that the Department of Agriculture in this Province is still in the chrysalis stage, so to speak, and it would be presumption for me to attempt to enlighten old Canada upon matters in respect of which we ourselves are still so far behind.

By reference to reports of immigration agents (copies of which I am mailing), you will observe that the subject of agriculture is only incidentally touched.

It is, perhaps, due to myself to mention that I hold the office of Minister of Agriculture in conjunction with several others, the duties of which, at present, absorb my attention.

I am, Sir, your obedient servant,
JOHN ROBSON,
Provincial Secretary, Minister of Mines, Finance and Agriculture.

DEPARTMENT OF AGRICULTURE, STATISTICS AND HEALTH,
WINNIPEG, MANITOBA, 20th Feb., 1884.

SIR,—I have the honor to acknowledge receipt of your letter of the 4th inst., asking as to the operations of this Department.

I have already sent you two copies of the Agriculture, Statistics and Health Act, 1883, under which the Department is administered; also copies of instructions to Registrars of vital statistics, a copy of the annual report of the Department for 1882, and copies of all the crop bulletins issued in 1883, still in print. The Dominion Department of Agriculture at Ottawa, has been supplied under an arrangement with this Department, with full statistical information as to the agricultural progress of the Province during 1883; and I would suggest that you communicate with the Secretary of that Department, Mr. Lowe, in reference to this branch of the subject.

The work of this Department is divided into several branches, the principal being as follows:—

1. The operations of the Board and Council of Agriculture. The Board is composed of thirty members, one representing each electoral division in the Province. The Council of the Board is composed of eight members selected so as to give territorial representation to each portion of the Province. The work of the Board embraces the supervision of the various electoral division agricultural societies, of which there are now twenty-six in operation, the management of the Provincial Exhibition, the representation of the products of the Province, at exhibitions in either of the Provinces, or any other countries; and generally the advising of the Department on matters relating to the agricultural interests of the Province.

2. Veterinary Sanitary Service. In this branch are included the establishment and management of a Veterinary School of Instruction, the supervision of the practice of veterinary surgery, and the licensing of practitioners, and the enforcement of the laws relating to diseases of animals. In this branch there is a consulting veterinarian, who is assisted in the discharge of his duties by seventeen district veterinarians acting in different counties in the Province. Attention is directed in this connection to the fact that the Veterinary Sanitary Service of this Department is the only one in existence in the Dominion, and probably the only one systematically organized on this continent.

3. Publication of bulletins relating to the condition of crops, and live stock, in collecting information, for which one voluntary correspondent acts in each settled township in the Province. These bulletins are published montly during the growing season.

4. Experiments in forestry and horticulture, and the observance of an annual arbor day for the carrying out of which object a Bill has been prepared by the Department to be introduced at the approaching Session of the Legislative Assembly.

5. Enforcement of the law for the destruction of noxious weeds. This duty, as in other parts of the Dominion, has heretofore remained entirely with the municipal authorities, but experience having proven that in their hands the law has

been a dead letter, the Department has been given power to appoint inspectors in various parts of the Province, who shall see that the pathmasters appointed by the municipalities do their duty.

6. Meteorology, especially the rainfall and snowfall, observations of which are taken at about fifty stations scattered through every portion of the Province. Co-operation in this work has been effected with the Dominion meteorological service which is supplied with the local reports of this Department, that service in return giving this Department the use of the returns from its temperature and other stations in Manitoba and the North-West.

7. Vital statistics, in recording which the clerk of each municipality acts as an agent of the Department.

8 The collection of general statistics relating to all branches of statistical enquiry and record.

9. The carrying out of the law in reference to the protection of game, fur-bearing animals, and insectivorous birds.

10. The operations of a public health branch in charge of a provincial health superintendent, with a medical health officer in each county.

11. The inspection and supervision of public hospitals receiving Government aid.

The publications of the Department at present consist of—First, reports embracing the whole work of the Department and its various branches, which are published annually; second, bulletins published monthly during the growing season of the crops.

In conclusion, I may say that the Department has only been in operation since June, 1882, and that much of the time during which it has been in existence, has therefore been necessarily occupied in the work of organization. A large amount of important work has been accomplished, and there is evidence on every hand of warm public approval with its objects and successes.

I have the honor to be, Sir, your obedient servant,

A. A. C. LARIVIÈRE,
Minister of Agriculture, Statistics and Health.

OFFICE OF AGRICULTURE, PROVINCE OF NEW BRUNSWICK,
FREDERICTON, 3rd March, 1884.

SIR,—Your communication addressed to the Hon. Provincial Secretary, requesting information relative to the laws of this Province for the encouragement of agriculture, has been handed to me, with directions to reply thereto.

1. There is a Board of Agriculture established by Act of Assembly, which takes charge of agricultural affairs and supervises the local societies. This Board consists of six members, nominated by the agricultural societies, and a chairman appointed by the Government, who must be one of the Government holding a Department, and a secretary. For the purposes of this Act the Province is divided into six districts, nominating one member each. I may here state that it is at present intended to amend the law during the present Session, increasing the members of the Board to fifteen—one from each county.

2. The Act of Assembly provides for four societies in each county, and grants $800 to be divided among the four societies on their list of subscriptions. There are fifteen counties, and all have four societies except one county having two—there are therefore fifty-eight societies.

3. There are no agricultural statistics made up except the meagre returns by the secretary of the agricultural societies, which you may see in the reports. These returns are quite unreliable for any public information, they are not paid for, and are made up by the secretary without any enquiry and without visiting the district. The question of collecting agricultural statistics has been taken up several times, with us, but never resulted in any practical arrangement. The want of money to pay the collector is the principal difficulty. Reliable returns would be invaluable. I trust something may be done to furnish these returns which are so much wanted.

4. I have sent you two copies of the Acts of Assembly relating to agriculture, and reports for all the years in which they were issued, that are available. That for 1883 will be ready in a few days, when I will forward it also.

As mentioned above, the Government are about introducing a Bill into the Assembly to consolidate and amend the present laws. It is not probable that the changes will be material, beyond increasing the number to fifteen. Grouping two or three societies to form one district has not been found to work well.

5. Some three years since the Government imported a number of cattle, sheep and swine and placed about 30 cattle, 40 sheep and 6 swine on a farm, as the beginning of a stock farm. With the exception that the farm selected has not proved suitable, this act on the part of the Government is much approved, and the short experience we have had of it shows that we can supply our farmers with a larger number of fine animals for the same amount of money than by importing.

I neglected to mention in the fourth paragraph that a copy of the rules and regulations for the government of the Board of Agriculture will be found along with the Acts of Assembly now sent.

I am not aware of any other information that would be of service to the Committee, but should anything more be required, it will be cheerfully furnished, so far as it is possible.

I am, your obedient servant,
JULIUS L. INCHES, *Secretary*

DEPARTMENT OF AGRICULTURE AND PUBLIC WORKS,
QUEBEC, 18th March, 1884.

SIR,—At your request I beg leave to forward my answers to the queries of your Committee. If all right-thinking men admit that the basis of a truly National Policy consists in securing for the whole country the most profitable agriculture, as the surest, and in fact the only mode of rendering all other national industries permanently successful, your Committee will, I trust, see how truly statesman-like was its organization, and how useful the work in hand.

My answers are numbered and refer to the same numbers in your queries:

First Query—Farmers' Disadvantages.

Principally from want of knowledge of his trade, and of the requirements of local as well as of foreign markets. The loss thereby occasioned to the Dominion, as well as to the farmers themselves, is stupendous, and equals annually the whole agricultural production of Canada—a loss amounting to over two hundred millions of dollars every year. In other words, our farmers, in the aggregate, do not produce over one-half of what they might and should.

Total Estimated Annual Value of Agricultural Produce. (See table of agricultural statistics annexed.)

Horses, $\frac{1}{10}$ of total value of stock	$ 5,331,420
Cattle, killed or sold only	16,442,025
Sheep do do	7,482,325
Swine do do	19,537,545
Wool and honey	3,012,758
(1) Total animal produce mentioned in Census	$ 52,306,073
Dairy produce	21,442,507
Hay	30,334,860
Grains and hay seeds	92,016,246
Roots	22,594,841
Grand total (at a low estimate)	218,794,528

(1) Many items of agricultural production are not even mentioned in the Census, poultry and eggs, for example. Yet this item cannot be less than $10,000,000 annually.

We have also no statistics showing what grain and hay, &c., are used on the farm to support both the farmer's family, his stock, &c. All these and more are needed.

Our wheat production in Canada (see Census of 1881), taking in our North-West and the large proportion of new lands still being reclaimed from the virgin soil and put into wheat in all the older Provinces, only averages 13¾ bushels per acre, whilst that of Great Britain, and other equally well-farmed European countries, exceeds 28 bushels, after centuries of productiveness. Our production of coarse grains is in a still smaller proportion, and yet all agriculturists who know Canada agree that our soil and our climate favor the highest agricultural production in the world, under a proper system of tillage.

There is certainly a remedy to this deplorable state of things. The most flourishing countries have suffered as we do now. But this remedy, to be more or less complete, lies in the power of the State alone. What is imperatively wanted is practical instruction in agriculture in general. Such instruction should be carried to the Canadian farmer, as it has been so successfully to the Danish, the Belgian, the French, and to the peasantry of so many other countries. In my opinion, even one hundred thousand dollars, carefully expended annually for the purpose of such technical instruction, would certainly, and even very soon, be returned to the Federal treasury many fold, after producing to the country at large at least one hundred fold.

Second Query—Cereals.

They are, generally, out of all proportion in good farming, and without anything like sufficient recuperation to the soil, thereby impoverishing and, too often, ruining the land. And yet, with a more rational system of farming, the quantity of cereals produced could be at least doubled, even on a much smaller acreage.

Hoed Crops—Roots and Maize.

The total area in hoed crops of all kinds does not exceed 4 per cent. of all the land in cultivation (1). Now, all good farmers know that the soil cannot be kept clean and properly pulverized, so as to produce the largest returns, without hoed crops—or its costly equivalent—summer fallows. In all well farmed-countries the proportion of hoed crops, to the land in cultivation is certainly 10 per cent., and often much more. Maize or Indian corn, one of the most profitable and easiest grown hoed crops of America, is certainly not sufficiently valued in Canada, although it very properly forms the basis of all farming, in even the most northern parts of the United States. Under the right culture, that is with an abundance of manure, and extensive horse cultivation, and with a proper selection of seed suited to our northern climate, we can easily produce an average of from 75 to 100 bushels of corn per acre, costing the farmer less than 25 cents a bushel, besides from 3 to 4 tons of excellent fodder, if well cured and properly prepared. As cattle food alone, corn for fodder comes here to perfection, and when cultivated with intelligence, and fed in connection with other food, it is the cheapest and one of the best articles of diet for the production of milk, or of flesh in growing animals.

Grasses.

The use of mixed grasses—outside of timothy and clover—is hardly known to our farming community. And yet, what we want, in our pastures especially, is the

(1). The Census of 1881 gives as improved land 21,899,181 acres, of which 464,229 acres are in potatoes. It does not give the acreage in corn or in other root crops. However, the quantity of corn grown is given in bushels at 9,025,142, and roots at 48,241,341. Now, allowing 30 bushels of Indian corn to the acre, and 500 of roots, the total acreage in hoed crops, including potatoes, would be 861,549 acres, or about 4 per cent. of the total improved land.

production of a variety of food, at all seasons of growth, more palatable to the cattle, and more profitable to the farmer.

Raising of Stock.

(See Agricultural Statistics annexed to 1st Query.)

It can be demonstrated, without cavil, that the cash value of our farm stock in general, and the annual returns therefrom, could be at least doubled, even in a few years: 1st. By better selection; 2nd. By a more rational system of feeding, in summer as in winter. Such a result implies a very possible and attainable increased value in capital, amounting to at least one hundred and fifty millions of dollars, and an annual production, over that at present, which would amount to the enormous sum of fifty millions of dollars!

Lowest estimated value of Farm Stock in Canada.

Horses and colts	$59,531,420
Working oxen	3,977,790
Cows	39,898,000
Other cattle	26,798,940
Sheep	15,243,390
Pigs	10,868,571
	$156,318,111

Eggs:

No stronger argument could, in my opinion, be used to show now much our agricultural production might be increased, by a little fostering care, than the production of eggs in Canada. These are so abundant all over the country that they form an important element of diet, even in the poorest cottage in the land. And yet, how many farmers count the egg crop as of any account on the farm? Not so, of course, with the good house-wife, who gratefully accepts from her lord and master these her modest perquisites. She feeds a few birds, really of no account as compared with the enormous capital invested in our farm stock; she teaches her children to look carefully after the eggs—and lo! not alone is the whole country abundantly supplied with royal food, but our exports of eggs are 40 per cent. above the value of all our exports in horses, or of sheep. Even the fat stock, requiring so many steamers to carry them over to Europe, do not produce over 75 per cent. more money than our exports of the so much despised egg crop.

Agricultural Exports, 1882-83. (See Trade and Navigation Returns, 1883.)

Horses	$1,633,291
Bovines and their produce in meat, &c	3,941,261
Sheep " " "	1,709,569
Swine " " "	588,972
Butter	1,705,817
Cheese	6,451,870
Eggs	2,256,586
Other animals and their produce	909,454
Total animal exports (not furs)	$19,196,820
" field products	22,818,519
Total agricultural exports	$42,015,339

Canadian Exports of Hay and Coarse Grains. (See Trade and Navigation Returns, 1883.)

Exports in barley		$ 6,293,233
" " peas		2,161,708
" " other coarse grains		1,554,183
		$10,009,124
Hay, 1881	$1,818,560	
" 1882	915,691	
" 1883	902,105	
	$3,636,356	
Average of three years		1,212,115
		$11,221,239

Horses.

Respecting horses, when the demand for really good horses, both draft and driving horses, is so great in Europe and in the United States, and when our facilities for the raising of the best horses in the world are considered, it is most painful to observe how comparatively small are the returns from this source. We export hay and coarse grains enough to raise easily ten times more horses than we do at present, for exportation. Why not keep this coarse feed, raise excellent horses—for no one wants bad or poor horses—and benefit from the very high profits in so doing? besides securing for the farm the not to be despised manure.

When we consider what continued efforts the Governments of England, France, Germany and Russia, without mentioning minor States, have made in order to improve the raising of horses, and the mighty results obtained, we may well affirm that this subject deserves to be made a State matter. However, I cannot do more than make mention of it here.

Cheese.

It is admitted, on the highest authority, that only 10 per cent. of the whole make of Canadian cheese is of the best; 25 per cent. of our total production sells at from 1 cent to 2 cents a pound less than the best; and the balance, 65 per cent., from 2 cents to 6 cents a pound less! Now, taking 70,000,000 pounds as our total make of cheese, the actual loss, from our not knowing how to make the best article, amounts to fully $3,000,000 annually.

Butter.

According to the Census (1881), our butter factories produced only a total value of $341,478, or about 1,500,0000 pounds. The home-made, or dairy butter, amounted 102,545,169 pounds.

It is admitted that whilst we have in Canada, through cold water and ice, every facility for the production of the best butter, not over 10 per cent. of this home made butter is of the best quality, whilst the balance sells fully 10 cents a pound below the full price of excellent butter in Canada, which shows a direct loss of $9,250,000 to the farmers and to the country on butter made annually. Moreover, what is lost from want of proper appliances to remove all the butter from the milk certainly amounts to 15 per cent. at the very least, on the whole make of dairy butter, causing an additional loss of over $3,000,000.

I sincerely believe that there is no exaggeration in the statement that Canada and Canadians actually loose over $15,000,000 annually, on their butter and cheese industry alone, as now made, besides what they fail to make. (1)

(1) A paper on commercial dairying in Canada is annexed, as showing the commercial features of this question of butter and cheese.

Taking the number of cows in Canada as given in the last Census, 1,595,800, and allowing 2½ pounds of cheese to 1 pound of butter, and from 8 to 9 ounces daily of milk to the whole population, we find that our cows do not produce an equivalent of 100 pounds of butter per cow, whilst there is no reason why we should not make 200 pounds per cow, or at 20 cents a pound, $32,000,000 more.

Through Government efforts, sustained by thorough patriots, and principally through one man, Prof. Segelcke, Denmark, has obtained these very results in the last forty years, viz.: It has improved the quality of its butter to the value of more than 20 cents a pound, and it has more than doubled, in fact, nearly tripled, the quantity produced per cow. (2)

I beg leave to call the attention of your Committee to one fact of great importance, respecting dairying as compared with beef fattening, which does not seem to be sufficiently known or valued in Canada. It is this, that it takes about as much food to produce a pound of meat, live weight, as it does of butter. This has been clearly proved in Denmark, more especially, by the weighing of all the food given to a large herd of cows during a whole winter, and the milk and butter produced, weighing with equal care the food given to a number of fattening oxen, and the meat produced during the same space of time (see Report of the Royal Agricultural Society of England, 1876, page 341). In the case in point, the food which produced a pound of meat, live weight, on an average, the season through, produced 21 pounds of milk from which two-thirds of a pound of butter was made and 1⅓ pounds of partially skimmed cheese, which is fully equal to over a pound of butter.

Fruit.

There is certainly much room for improvement in fruit raising, considering the great national facilities Canada possesses for the economical production of fruit. However, there is evidently a lively interest being developed on this subject at present, for which much credit is due to Charles Gibb, Esq, of Abbottsford, Que., amongst others.

Fertilizers.

Farm manure is certainly wasted to the extent of 75 per cent., and from this source alone we lose one-half of what our lands would otherwise produce with the same labor and capital. The liquid manure, which is worth more than the solid matter, is mostly all lost; then the solids are eave-washed, burned or fire-fanged before carting to the field, and there too often sun dried. As generally treated by nearly all farmers in Canada, manure goes to waste, to a greater or lesser degree, but aggregating to 75 per cent., as I believe can be proved unquestionably. As long as this waste is allowed, but little interest can be given to the very important question of artificial fertilizers.

3rd Query—Seeds.

Interchange of Canadian seeds, of the best quality only, and from west to east, and possibly from east to west, should prove of great value. This can be encouraged with little risk and without expense. Most careful experiments with foreign seeds

(2) Whilst the average prices for butter in Canada range from 15 cents to 25 cents a pound, according to quality, it has been shown (See the Royal Agricultural Society of England's Report, 1876, page 330) that the prices in Denmark, at the farmers' door and for the English market, range from 19 cents to 38 cents. And yet, from want of direct communications, freight and charges are nearly as high as with us, amounting in all from Canada to not over ½ cent a pound. Now, our very best butter is *not inferior to the best Danish*, as some of our makers have passed several months in Denmark to learn how they could improve our Canadian butter. In fact, the enormous difference in prices between Canadian best and best Danish, is mainly due to the reputation acquired and to the steady supply of Danish butter on the English markets, and to the very uncertain supplies from Canada.

Again, the production of butter per cow in Denmark in 1841 was 85 pounds, on an average, per year, and 94 pounds of skimmed cheese, whilst in 1872 it was 215 pounds of butter and 300 pounds of cheese per cow. (See Royal Agricultural Society's Report, 1876, page 352.)

often prove of inestimable benefit, but they require more time and money, as well as very careful supervision.

4th Query—Inspection and Branding of Butter and Cheese.

I think not. Butter and cheese are sold on their merits, by appearance and taste, and are packed in such a way as to be easily examined. But what is very much required is a system of practical inspection of all cheese and butter factories by an excellent teacher in the making of the very best articles. These visits have obtained most excellent results where tried, in Ontario and in Quebec, under the auspices of the Diarymen's Associations. One short stay of a few hours in a factory, whilst cheese is being made, has enabled the inspector to show where the error lay, causing a loss of from 1 cent to 6 cents per pound on the cheese made during a whole season, a loss often greatly exceeding $1,000 in each factory.

Such teachers could, at the time of their visit, cause the farmers to be brought together, and then and there a practical lesson, or lessons, in all that pertains to the dairy might be given with extraordinary results. With the proper appliances at hand, a qualified instructor can teach, in one lesson, how the best butter is produced, and in a few more hours, how good dairy cheese is made. This system of practical teachings carried to the farmer, and supported by printed tracts, has obtained wonderful results wherever tried, in France, Belgium, Denmark, &c., and lately in Ireland.

Such inspections and conventions might be organized in such a way as not to cost $10 per day all told. Notes might also be taken, at the same time, of the general state of agriculture in the localities visited, by calling on one or more of the best farmers; and the results of such visits, under proper direction from a central Bureau, should become of inestimable value to the country.

5th. Of very great benefit, provided the party in charge was thoroughly fitted for such works. 6. Analysis of soils, so far, I believe, have generally proved of very little, if of any use; but it is entirely different with the analysis of artificial fertilizers. It is universally demonstrated that such manures cannot become of general use until they are sold on their true merit, as guaranteed by a respectable chemist holding an official position for such control. 7. Such establishments, when under proper supervision and direction, must prove of inestimable value. However, one only could hardly be of general benefit throughout the Dominion; although one main establishment, in connection with smaller provincial experimental stations might prove of great benefit. 8. Yes; of insects, for, unfortunately, we have very few birds left, either for good or for evil. 9. The cut-worms (larvæ of the May and other beetles) do perhaps more harm than all others to vegetables and even to young grain in this Province. 10. Unfortunately, in our Province, nothing of any practical account has ever been attempted. 11. The loss from various insects, to each of the above products, is certainly incalculable. I have knowledge of whole fields of turnips being re-sown as many as three times and destroyed by the turnip fly. The same of cabbages, &c., &c. Apples were mostly a total failure for the last two years. 12. Yes; the tent caterpillar has done great damage to forest trees, last year especially. 13. A good entomologist—if of a practical turn of mind—could do untold good. 14. Certainly; when such diseases are reported as contagious, especially. Another great benefit which might be derived from this staff would be in the possible inspection of stallions, were the Government to take action in the fostering of horse raising of a better kind. Dr. McEachran's suggestion, of putting on a heavy tax on all stallions unfit for useful reproduction, appears to me invaluable, if intelligently acted upon. 15. Timber is being destroyed, unmercifully, all over the Province, in nearly all the settlements where there is still a good supply. In the older settlements, timber is becoming very scarce and expensive. Many municipalities are so situated that the inhabitants have to travel fifteen to eighteen miles to bring home a load of wood. Yet no systematic effort has so far been made.

6—3½

of any account, to check its alarming scarcity. 16. The Quebec Government policy, with its Arbor Day and improved regulations regarding forestry, gives promise of future good. The Honorable Mr. Joly's efforts, those of Mr. James Little, and those of Mr. J. C. Chapais, deserve a most honorable mention. However, this can only be termed "a modest beginning." 17. A beginning was made last year through the Province. The results are encouraging, as proving that the public feels the importance of the subject. A fair success was obtained with the trees planted. We want now a regular organization all through the Dominion, so that statistics can be obtained and information given from every municipality in the country. Without such organization it is impossible to obtain any correct data of a general nature, either in tree planting or on any other subject. 18. Yes; my previous answers go to show that this organization, if well made, would be of incalculable good to the Dominion, and that great improvement in the general agriculture of the country cannot be obtained without it. However, too much must not be attempted at first, nor expected from such a Bureau. Certain results, of the most pressing nature, should be aimed at, and all efforts centered on these until success was attained, and so on, step by step. The danger of such Bureau is in attempting too much at first; going to enormous expense, and drifting into more or less complete uselessness. 19. Undoubtedly; however, very short and pithy tracts, on separate subjects, should, in my opinion, do more good than the immense volumes published at Washington. The distribution of such printed should also be made with care and only where useful. Possibly, a small charge for such information would cause it to be better appreciated. At all events, there is great danger of drifting into enormous printing expenses on this score. 20. Yes; by all means, as a part of the Central Bureau and under the one direction. The producer would thus find out, in many ways, how his management compares with that of other Canadians situated exactly as he is, and the result would create an animated competition by which untold wealth should be extracted from the soil. 21. I would much prefer occasional publications of undoubted importance, to rigid monthly bulletins, which are certainly costly, but not always useful. 22. It strikes me that a thorough system of collecting statistics, and distributing valuable information to farmers all through the country, could be obtained through the secretaries of municipalities. Such a system, if regulated by special laws emanating from the Local Legislatures, need cost but comparatively little, and could be made thoroughly effective: 1st, by complete supervision from a Central Bureau, and 2nd, by heavy penalties strictly enforced.

ED. A. BARNARD,
Director of Agriculture, Department of Agriculture, Quebec.

Translation.

ANSWERS TO QUESTIONS 8, 9, 10, 11, 12 and 13 of the Circular of the Select Committee on Agricultural Industries:

The insects which are doing more or less damage in the Province of Quebec are the following:

Cut worm	Agrotis messoreia	Agrotis (ver blanc).
Cabbage flea	Haltica	Altise.
Onion maggot	Anthomyia ceparum	Anthomie de l'ognon.
Currant geometer	Ellopia ribearia	Arpenteur.
Pea weevil	Bruchus pisi	Bruche des pois.
Curculio	Conatrachelus nenuphar	Charancon du prunier.
Tent caterpillar	Clisiocampa Americana	Chenille à tente.
Forest tent caterpillar	do Sylvatica	Chenille à tente des bois.

Potato bug	Doryphora decemlineata.	Chrysomèle des pommes de terre.
Imported saw-fly	Nematus ventricosus	Nematé.
Cabbage butterfly	Pieris rapae	Papillon des choux.
Appletree plant louse	Aphis mali	Pou du pommier.
Codling worm	Carpocapsa pomonella	Pyrale de la pomme.
Striped borer	Saperda candida	Saperde blanche.
Five-spotted sphinx	Sphinx quinque maculatus.	Sphinx à cinq taches.

The plants which suffer from the ravages of these insects are:

Forest trees, fruit trees, currants, onions, apples, gooseberries, potatoes, cabbages, turnips, pease, plums, tobacco.

The following is a classification of the losses occasioned in our Province:

Forest Trees.—They have been seriously affected within the last few years by the forest-tent caterpillar.

Fruit Trees generally.—They have been attacked by striped borer and the tent caterpillar. The tent caterpillar is already doing great injury in the western part of the Province, and is beginning to invade the eastern portion. The striped borer is doing its destructive work nearly everywhere, and has now imperilled the existence of many of our orchards.

Cabbages and Turnips.—The cabbage flea is a dangerous enemy to these plants. The cabbage plant is, moreover, liable to the attacks of the cabbage butterfly and the cut worm. The cut worm does considerable damage to the young cabbage and turnip plants. The cabbage butterfly did so much damage that it prevented the growing of cabbages for several years. It shows signs of disappearing now. The cut worm is doing great harm also, and is very difficult to overcome.

Currants and Gooseberries.—These shrubs are every year, and nearly throughout the whole Province, a prey to the currant geometer and the saw-fly. These insects rendered the cultivation of currants and gooseberries all but an impossibility, until a remedy was found in the use of Paris green, mixed with plaster, in the proportion of 1 lb of green to 100 lbs. of plaster.

Onions.—The onion has for some years been a prey to the onion maggot in certain parts of the Province. Wherever the maggot takes up its quarters, the growing of onions must cease.

Potatoes.—The potato has for nine years past been a prey to the potato bug. The mixture of Paris green and plaster, above indicated, is an effectual remedy.

Pease.—The pea crop is beginning to suffer from the ravages of the weevil, and in some places has been nearly destroyed.

Apples and Apple Trees.—The tree is liable to the assaults of three insects, which inflict serious injury. The *plant louse* attacks the leaves and young shoots. It is doing extensive injury in the western part of the Province, and is beginning to invade the east. The codling worm attacks the fruit. Lastly, the striped borer assaults the tree itself and bores its way through the wood. Last year and this year the cut worm has certainly injured the whole apple crop to the extent of one-half. The losses inflicted by the other two insects are not so great, but seem likely to become considerable.

Plums.—In the western part of the Province the fruit of the plum tree is being destroyed by the curculio. There is reason to fear that this insect will cause as much loss here as it did first in the United States, and then in Ontario.

Tobacco.—Complaint is made in some places of danger to the crop from the spotted sphinx. However, the insect has not as yet become widely diffused, and it is easily destroyed.

There are many more or less effectual remedies against these insects, but they are not extensively used. Specialists strive to diffuse a knowledge of injurious insects and of agents for their destruction, but they find the public indifferent. In fact the people have yet to be educated in this matter.

Undoubtedly the appointment of an entomologist, and the circulation of short pamphlets giving concise and simple instructions for the destruction of injurious insects, would do great good.

J. C. CHAPAIS, JUN.,
Department of Agriculture, Quebec.

COMMERCIAL—DAIRYING IN CANADA (1).

In 1858 our exports of cheese were purely nominal, amounting, for that year, to $1,497.00. The following year they increased over 200 per cent.; again, in 1860, the increase is nearly 400 per cent. in twelve months—and so on, in a wonderful manner, to this year, when the increase in our exportation is estimated at 25 per cent. over that of last year—itself the largest on record.

EXPORTATION of Cheese from Canada. (See Trade and Navigation Reports.)

Year.	Lbs.	Value.	Year.	Lbs.	Value.
		$			$
1858	13,104	1,497	1873	15,208,633	2,280,412
1859	36,156	4,667	1874	24,050,982	3,523,201
1860	124,320	16,199	1875	32,342,030	3,886,226
1861	294,336	23,937	1876	37,885,286	4,050,008
1862	491,680	49,226	1877	37,700,921	3,897,965
1866	974,736	123,494	1878	39,371,139	4,121,301
1868	1,577,072	193,554	1879	49,616,415	4,034,750
1869	6,111,482	117,943	1880	43,441,112	4,094,046
1870	5,827,782	674,486	1881	54,713,020	6,691,534
1871	8,271,459	1,109,906	1882	55,325,167	5,979,537
1872	16,424,025	1,840,284	1883	58,041,387	6,451,870

Now, if we turn to our butter trade in the past and compare it with the present, we, unfortunately, have no reason for congratulation, but the reverse.

In 1862, before Confederation, the united Provinces of Ontario and Quebec, alone, exported more butter than the whole Confederation of Canada does now; the figures being, for 1862, a total of 8,905,578 lbs., whilst for 1883, a total of 8,106,447 lbs.

It is true that 1882-83 has been an exceptionally bad year for butter exports, the decrease from the previous year being no less than 46 per cent., our exports for 1881-82 reaching over 15,000,000 lbs., whilst in 1880, they were nearly 19,000,000 lbs

EXPORTATIONS of Butter from Canada. (*See* Trade and Navigation Reports.)

Year.	Lbs.	Value.	Year.	Lbs.	Value.
		$			$
1858	3,721,200	480,712	1873	15,205,663	2,208,979
1859	3,750,296	526,250	1874	12,233,046	2,620,305
1860	5,512,500	792,621	1875	9,268,044	2,337,324
1861	7,275,426	841,646	1876	12,592,367	2,579,431
1862	8,905,578	1,132,772	1877	15,479,550	3,224,981
1866	10,448,789	2,091,270	1878	13,504,117	2,474,197
1867	10,817,918	1,741,291	1879	14,536,246	2,138,447
1868	9,956,448	1,587,728	1880	19,887,703	3,119,162
1869	10,853,268	2,342,270	1881	17,820,278	3,611,888
1870	12,259,887	2,353,570	1882	15,338,488	2,975,170
1871	15,439,266	3,065,229	1883	8,106,447	1,705,817
1872	10,068,448	3,612,679			

(1). A paper read, by special request, at the Western Dairymen's Convention, London, Ont., on the 14th February, 1884, and at Peterborough, Ont., on the 21st February, 1884, before the Eastern Ontario Dairymen's Convention, by Ed. A. Barnard (Director of Agriculture at the Department of Agriculture and Public Works, Quebec).

We see by the table just quoted that our butter trade has been at a stand-still ever since 1871, when our exports were over 15,000,000 lbs.

Now let us look for the main cause of this very unsatisfactory butter trade: At first sight, from the fact that at present, it apparently pays better to make cheese than butter, this alone, to many, seems to explain the falling off in our butter trade. A second and, in my opinion, still better reason for this decrease, is the unsteadiness of the demand for Canadian butter. Let us now look into this latter argument: Our export market for butter is undoubtedly Great Britain. Nearly 80 per cent. of our butter goes there. England wants the best brands alone; poor butter is there, as elsewhere, a drug on the market. Whilst the best brands of imported butter are quoted from 120s. to 144s. per cwt., Canadian and even American brands only reach from 60s. to 122s.

AVERAGE of current prices of Butter and Cheese on first Saturday in January in each year, from the latest actual market sales. (*See* "Journal of the Royal Agricultural Society of England," 1883, part 1st, p. xxviii.)

—	Average Annual Price in the 5 years, 1875-79.	Current Price, 1st January, 1880.	Current Price, 1st January, 1881.	Current Price, 1st January, 1882.	Current Price, 1st January, 1883.
Butter.	Per cwt. s. s.	Per cwt. s. s.	Per cwt. s. s.	Per cwt. s. s.	Per cwt. s. s.
Carlow, finest F.O.B	131 to 144	126 to 140	120 to 140	112 to 138	120 to 140
do landed	138 " 148				
Cork, 1sts	143 " 148	145	141	136 to 140	
do 2nds	133 " 137	143	132 to 135	129 " 131	120 to 136
do 3rds (new)	108 " 109	115	105	131 " 113	120
do 4ths	90 " 91	96	78	82	120 " 92
Limerick	124 " 129				
Foreign—					
Friesland	132 " 137	128 to 134	120 to 130	125 to 144	125 to 136
Jersey, &c.	94 " 134	125 " 136	110 " 125	110 " 140	110 " 134
Kiel	135 " 164				
Normandy	92 " 151	120 to 146	108 to 140		
American	81 " 121	90 " 135	95 " 125	60 to 122	
Bosch		65 " 95	65 " 84	50 " 85	60 " 90
Cheese.					
English Cheddar, fine new	72 to 90	72 " 86	76 to 90	76 to 82	68 to 82
do good new					
Red Somerset Loaf	77 to 87	74	76 to 82	74 to 78	74 to 76
White or Yellow Cheddar Loaf	78 " 87				
Scotch Cheddar	164 " 189				
Cheshire, new	78 " 86	64 to 86	74 to 88	72 to 82	68 to 80
do good new	53 " 71				
North Wilts Loaf, new	72 " 81		72 to 82	76 to 81	74 to 76
Derby Loaf, new	74 " 64	70 to 74	76 " 84	76 " 84	72 " 76
Wiltshire, new	70 " 79	62 " 76	70 " 80	64 " 74	62 " 72
do good new	60 " 68				
Foreign—					
American, fine	63 " 67	64 to 68	68 to 72	60 to 68	62 to 70
do good	41 " 59	56 " 60	56 " 66	42 " 60	46 " 58
Gonda	52 " 61	56 " 62	60 " 66	56 " 62	54 " 62
Edam, new	56 " 65	56 " 64	62 " 68	57 " 64	56 " 64
Gruyère, new	76 " 85	71 " 78	62 " 82	72 " 75	72 " 75

If we now turn to the butter exports to England from Normandy, in France, and from Denmark, we find their trade increasing in a most satisfactory manner. Let us take Denmark for example:

Not more than fifty years ago, Danish agriculture was certainly not ahead of ours. All, or nearly all, the grain and hay Denmark then produced, was sold out of

the country. Cows were fed on straw all winter, and the butter produced in summer was of very little amount and of poor quality. Now, Denmark sells neither grain nor hay; on the contrary, it imports more grain and oil cake for its cows than the whole country used to export years ago. Cows, instead of giving little butter in summer alone, are made to give an average of 250 lbs. for each cow; many farmers producing annually over 300 lbs. per cow, on an average, on large herds. Moreover, about 70 per cent. of all the cows in Denmark are made to give more butter in winter than in summer, the calving of such cows taking place between September and January.

Although the English cheese market is open to them as well as the butter market, their principal production is, firstly, butter, and secondly, skim cheese.

The following table shows the wonderful increase in butter exports, from Denmark to Great Britain, from 1865 to 1881, or in sixteen years. (*See* "Journal R. A. S., England," 1883, part 1st, p. xxviii.)

QUANTITY and Value of Butter imported into Great Britain from Denmark.

Year.	Quantity.	Computed Real Value.	Year.	Quantity.	Computed Real Value.
	Cwt.	£		Cwt.	£
1865	65,555	362,440	1874	226,053	1,363,433
1866	67,305	319,528	1875	206,171	1,275,870
1867	80,589	422,479	1876	205,195	1,311,234
1868	79,437	471,262	1877	216,322	1,347,791
1869	103,613	574,981	1878	242,427	1,517,467
1870	127,013	767,190	1879	281,740	1,679,452
1871	140,858	803,226	1880	300,157	1,777,176
1872	173,574	1,009,322	1881	279,627	1,691,894
1873	201,558	1,203,459			

We see here that whilst our Canadian butter trade has been at a stand-still, and worse, since 1872, the Danish butter exports to the same market as ours have increased steadily by nearly 100 per cent.

If we now compare our exports in butter to England with those of other countries besides Denmark, we find that whilst we are even going back, our competitors are progressing in a most satisfactory manner to themselves.

Thus, Holland has steadily increased its exportations nearly 200 per cent. from 1872 to 1880. (*See* as above, page xxix.)

Year	Quantity.	Value.	Year.	Quantity.	Value.
	Cwt.	£		Cwt.	£
1872	269,091	1,358,579	1877	372,134	2,084,686
1873	272,004	1,453,875	1878	460,601	2,494,903
1874	351,605	1,877,755	1879	655,377	3,331,149
1875	357,106	1,917,910	1880	810,509	4,076,399
1876	402,984	2,252,909	1881	745,536	3,745,885

How much of this increase is due to oleomargarine I shall not venture to say, although I believe it to be very large. But from the quoted reports, even this artificial produce from Holland is quoted at much better prices than we can obtain for our butter.

Now, if we compare even American exportations of butter to England, their trade is most satisfactory, whilst ours is going back, as I have already mentioned.

Thus, whilst we exported in 1873-74 over 15,000,000 lbs. of butter, principally to England, the exports of the United States there were little over 4,000,000 lbs. But they doubled every second year or so, until they reached nearly nine-fold in six years (from 1874 to 1879), being then nearly 34,000,000 lbs.

Year.	Quantity.	Value.	Year.	Quantity.	Value.
	Cwt.	£		Cwt.	£
1874	36,307	188,769	1878	219,794	998,766
1875	40,331	205,900	1879	301,054	1,243,075
1876	118,131	593,122	1880	277,790	1,343,967
1877	188,491	920,761	1881	174,246	845,125

(*See* as above, page xxix.)

Therefore, if we look for the reason of the unsteadiness of the demand for Canadian butter, we must, no matter how painful the public avowal, admit that the true and only reason is the very poor quality of our butter.

I have asked the largest exporters of butter in Montreal an estimate of the relative proportion of fine butter to poor. They answered that they were not far wrong in the following:—

Finest Canadian butter	.....	5 to 10 per cent.
Fine do	.....	25 to 30 do
Poor do	.....	50 to 60 do

I leave you, gentlemen, to estimate the amount of loss this means to the country annually. I shall only say, that the butter makers of this country can, right here, stop a leak in their net profits, amounting, in the aggregate, to millions of dollars annually.

Let me now refer back to the very important question as to which pays best, butter-making or cheese-making. I have given you the experience of Holland, and Denmark is the same as ours. It is a remarkable fact, that whilst in Canada farmers think cheese making pays better than butter making, the contrary seems to be the experience of Denmark and Holland. In these countries butter is the principal industry, and what cheese is made comes from milk more or less skimmed. We give here the exports and value of such cheese to England, from Holland alone. By comparing figures, it will be seen that the quantity shipped and the prices obtained for such skimmed cheese, compare most favorably with our exportations of full milk cheese. (*See* as above, page xxix.)

Year.	Quantity.	Value.	Year.	Quantity.	Value.
	Cwt.	£		Cwt.	£
1872	329,535	942,537	1877	341,980	984,855
1873	336,654	1,013,233	1878	355,159	1,018,669
1874	398,868	1,164,921	1879	275,039	743,107
1875	370,123	1,078,594	1880	288,666	810,590
1876	330,435	949,413	1881	264,626	747,052

In such a study, and in order to arrive at an exact conclusion, you will admit with me, that all the elements of the case must be taken into consideration.

Now, let us see if it would be prudent to increase very largely the production of Cheddar cheese—the only kind made in Canada, as a rule—over what it is at present.

That such production could be increased even ten-fold in a very few years, is to me the more evident that, in our Province alone, not one single cheese factory existed in the French settlements, up to 1872. Now, we produce in those same settlements nearly one-quarter of all the cheese manufactured in Canada. And there is still room for an increase of a hundred-fold. In the Maritime Provinces, where facilities for butter and cheese making are, in my opinion, at least fully equal to those of Quebec, hardly any cheese is exported.

THE following Table showing our total exports in Butter and Cheese, and where exported, is taken from the Trade and Navigation Returns for 1883.

—	Quantity.	Value.
BUTTER.		
Great Britain.	Lbs.	$
Ontario	1,205,591	266,850
Quebec	5,023,242	1,063,458
Nova Scotia	1,260	262
P. E. Island	80	15
	6,230,273	1,330,585
United States.		
Ontario	331,995	60,424
Quebec	626,085	139,616
Nova Scotia	4,485	992
New Brunswick	20,059	4,447
P. E. Island	3,767	655
British West Indies.		
Nova Scotia	35,861	8,078
P. E. Island	300	60
	36,161	8,138
Spanish West Indies.		
Nova Scotia	1,980	370
Danish West Indies.		
Nova Scotia	62,782	12,992
Brazil.		
Nova Scotia	105	26
St. Pierre.		
Nova Scotia	120	20
Danish West Indies.		
Nova Scotia	664	82
French West Indies.		
Nova Scotia	1,000	100
British Guiana.		
Nova Scotia	9,189	1,339

—	Quantity.	Value.
CHEESE.		
Great Britain.	Lbs.	$
Ontario	12,144,134	1,356,608
Quebec	45,528,709	5,053,235
P. E. Island	116	14
	57,672,959	6,409,857
United States.		
Ontario	220,945	24,960
Quebec	415	91
Nova Scotia	87	7
British Columbia	12	3
P. E. Island	70	7
	221,529	25,068
Newfoundland.		
Nova Scotia	470	60
P. E. Island	5,656	567
Quebec	125,914	14,833
	132,040	15,480
British West Indies.		
Nova Scotia	3,551	482
New Brunswick	135	17
P. E. Island	200	25
Newfoundland.		
Quebec	387,983	73,611
Nova Scotia	303,029	56,097
P. E. Island	11,021	2,233
	702,033	131,341
St. Pierre.		
Quebec	11,606	2,308
Nova Scotia	67,120	12,443
P. E. Island	7,143	1,302
	85,869	16,053
Madagascar.		
Nova Scotia	125	25
British Guiana.		
Nova Scotia	625	125
New Brunswick	140	28
	765	153
Japan.		
British Columbia	67	30

RECAPITULATION.

Ontario	1,537,586	327,274	Ontario	12,365,079	1,380,969
Quebec	6,048,912	1,278,393	Quebec	45,655,038	5,068,179
Nova Scoiia	477,372	91,360	Nova Scotia	15,081	2,090
New Brunswick	20,199	4,495	New Brunswick	135	17
British Columbia	67	30	British Columbia	12	3
P. E. Island	22,311	4,265	P. E. Island	6,042	613
	8,106,447	1,705,817		58,041,387	6,451,870

Again, gentlemen, if we examine the cheese imports of England, we will observe that they do not increase in that hopeful proportion which we might be led to suppose, from what may have been said in this very convention.

Great Britain imported in—

1879		1,789,168 cwts.	of cheese.
1880	(less)	1,773,503 do	do
1881	(a little more)	1,834,480 do	do
1882	(considerably less)	1,692,495 do	do

The following table shows the agricultural imports into England, and may prove interesting:

CERTAIN Articles of Foreign and Colonial production Imported in the Years 1879-82' and their Quantities.

—		1879.	1880.	1881.	1882.
Animals (living)—					
Oxen, Bulls and Cows	No.	208,720	350,950	.....	309,360
Calves	"	39,172	38,999	.....	4,340
Sheep	"	944,869	940,991	935,244	1,124,391
Lambs	"				
Swine and Hogs	"	52,267	51,030	24,273	15,670
Bones (burnt or not, or as animal charcoal)	Tons.	65,067	79,740	65,007	54,401
Cotton, raw	Cwt.	13,171,043	14,547,283	14,952,724	15,794,566
Flax	"	1,694,051	1,896,249	1,791,762	1,966,969
Guano	"	76,945	78,965	50,072	45,095
Hemp	"	1,204,036	1,320,731	1,475,421	1,354,407
Hops	"	262,616	196,688	146,710	315,377
Hides, untanned, dry	"	545,373	660,198	554,134	576,451
do wet	"	463,086	584,693	454,295	613,593
Petroleum	Tuns.	170,831	152,672	234,968	Galls. 59,135,384
Oilseed Cakes	Tons	216,002	243,998	220,790	190,252
Potatoes	Cwt.	9,352,236	9,420,263	4,034,577	2,997,514
Butter	"	2,045,606	2,319,802	2,046,421	2,167,428
Cheese	"	1,789,168	1,773,503	1,834,480	1,692,495
Eggs	Great hundreds.	6,388,838	6,228,437	6,306,645	6,757,234
Lard	Cwt.	838,897	929,616	855,796	665,885
Bacon	"	3,996,922	4,370,860	3,858,855	2,348,060
Hams	"	906,121	938,269	747,009	548,507
Salt Beef	"	242,864	289,422	248,698	227,748
Salt Pork	"	400,591	389,057	349,709	266,229
Clover Seed	"	345,206	271,609	279,925	354,869
Flax Seed and Linseed	Qrs.	1,665,333	1,712,576	1,829,838	2,437,918
Rape	"	365,340	400,694	373,028	547,679
Sheep and Lambs' Wool	Lbs.	411,106,627	460,337,412	447,044,809	483,954,318

I do not know what the official figures may be up to last December; but I cannot see that the consumption of cheese in Great Britain had any reason to increase within that time, as high prices on cheese were, on the whole, fully maintained.

If we now consider that we are *crowding* our American friends pretty closely, in cheese, on the English market, we will see at a glance that somebody must suffer, if our increase of production in one kind of chese only continues as it has done in the last ten years. The tendency certainly is towards an increase in a much larger ratio than ever.

UNITED STATES EXPORTS.

(*See* Trade and Navigation Returns of the United States.)

Year.	Quantity.	Value.	Year.	Quantity.	Value.
BUTTER.	Lbs.	$	CHEESE.	Lbs.	$
1873	4,518,844	952,919	1873	80,366,540	10,498,010
1874	4,367,983	1,092.381	1874	90,611,077	11,878,995
1875	6,360,827	1,506,996	1875	101,010,853	13,659,603
1876	4,644,894	1,109,496	1876	97,676,264	12,270,083
1877	21,527,241	4,424,616	1877	107,364,666	12,700,627
1878	27,837,117	3,931,822	1878	123,783,736	14,103,529
1879	38,248,016	5,421,205	1879	141,654,474	12,579,960
1880	39,236,658	6,690.687	1880	127,553,907	12,171,720
1881	31,560,500	6,256,024	1881	147,995,614	16,380,248
1882	14,794,305	2,864,570	1882	127,989,782	14,058,975

It has been shown that when every element is considered, and in a series of years, butter making pays the farmer fully as well as cheese making.

The comparative calculation is easily made: 100 lbs. of standard milk will make, in Ontario, 9½ lbs. of cheese or 4 lbs. of butter. Whey is considered of little account, being valued at about 5 cents a 100 lbs.

Therefore, we have—

9½ lbs. of cheese, say 10 cts. net, a very high average	= 95 cts.
Whey	5
Total	$1.00
Butter, 4 lbs., at 20 cts. net	80
Skimmed milk	20
Total	$1.00

Now, all authorities agree that, in calf feeding or pig raising, sweet skimmed milk is worth *one-half* of the full milk, so 20 cts. *is not* the real value, for a careful farmer. It has been shown in some of the experimental stations under Government control, in the United States, that, under proper care, 100 lbs. of skimmed milk produce 6¼ lbs. of pork, live weight. This shows the real value of skimmed milk for meat production.

I shall but mention one more element, and a very important one, in my estimate. Cheese producers are generally of opinion that they had better not raise any heifer calves, but buy milch cows. They may be right in their calculation, that milk at 1 cent per pound is too high to raise common calves with. But, then, where shall we go for milch cows, if cheese producing becomes the rule and butter making the exception? With butter making, as it has been shown here, there is no difficulty in raising *the best* dairy cows on skimmed milk, with a little fattening food added, such as pea or oatmeal, oil cake, &c.

Now, respecting a market for our butter: First, we have our home market, which will increase many fold when really good butter will be the rule instead of the exception. Where is the family, with a cultivated taste for butter, which will accept and consume *poor* butter in any quantity? Those who have tried the experiment know how much butter their own families will consume of good, *really excellent* butter, and how little of poor butter. I do not exaggerate in stating that in such cases the difference is four-fold, and the difference in price 40 per cent.

Then we have the English market, where the *best of butter* is always in demand, and the supply nearly always short. Again, we have all the markets of the world which the United States are just now opening up for us as well as for themselves.

We here see (in the following table) that even Canada imports 274,547 lbs. of butter from the States, and that only about two-thirds of the American exports in butter go to Great Britain. Moreover, that Newfoundland, Labrador, Miquelon and St. Pierre import 549,339 lbs. of butter from the States, which should, evidently, be taken from Canada, if Canadians could supply it.

Countries to which Exported.	Butter.	Cheese.	Condensed Milk.
	Lbs.	Lbs.	$
Argentine Republic	1,000	140	16
Belgium	126,000	224	.....
Brazil	425,176	6,447	1,058
Central American States	31,393	22,467	3,465
Chili	2,802	1,165	176
China	25,384	26,378	10,631
Denmark	98,763	.....	.....
Danish West Indies	34,508	26,672	476
France	311,427	21,566	.....
French West Indies	82,957	7,246	16
do Guiana	1,008	.....	511
Miquelon, Langley and St. Pierre Island	96,991	.....	.....
French Possessions in Africa and adjacent Islands	1,004	.....	.....
do all other	13,740	4,565	764
Germany	1,760,197	134,100	467
England	17,147,428	119,903,552	48,669
Scotland	6,334,382	21,111,543	.....
Ireland	.....	107,300	.....
Gibraltar	10,337	985	.....
Nova Scotia, New Brunswick and Prince Edward Island.	30,784	250	115
Quebec, Ontario, Manitoba and North-West Territories	130,257	5,195,977	436
British Columbia	113,556	37,442	2,503
Newfoundland and Labrador	452,348	2,687	.....
British West Indies	1,661,399	495,086	10,470
do Guiana	88,716	162,588	.....
do Honduras	63,776	22,890	2,856
do East Indies	.....	234	.....
Hong Kong	7,061	26,954	9,514
British Possessions in Africa and adjacent Islands	73,079	2,799	43
do Australasia	749	.....	20
Hawaïan Islands	104,863	31,404	5,824
Hayti	426,595	129,055	.....
Italy	103	970	.....
Japan	106,306	56,808	12,589
Liberia	1,920	927	183
Mexico	94,267	45,522	1,185
Netherlands	21,032	673	.....
Dutch West Indies	152,400	9,863	408
do Guiana	67,272	.....	.....
do East Indies	300	250	.....
Portugal	80	.....	.....
Azores, Madeira and Cape Verde	984	100	.....
Russia (Asiatic)	76,645	1,482	90
San Domingo	94,065	34,782	281
Spain	200	1,822	.....
Cuba	306,950	71,555	14,797
Porto Rico	245,646	247,085	.....
Spanish Possessions in Africa and adjacent Islands	602	900	.....
Sweden and Norway	1,619	174	.....
Turkey in Asia	.....	1,030	.....
United States of Columbia	269,883	47,117	10,731
Uruguay	12,086	2,257	138
Venezuela	338,831	17,158	148
Other countries in South America	739	450	32
do Africa	.....	110	369
All other islands and ports not elsewhere specified	1,669	1,773	.....
Total	31,560,500	147,995,614	139,407

I leave you, now, gentlemen, to ponder over this question of the present and future of commercial dairying in Canada. I have shown before this convention, in previous years, how dairying pays as compared with beef raising in Canada. The fact that our world-renowned butter producer of Hamilton, Mr. Valency Fuller, shows us how to produce 850 lbs. of butter in a year, worth 25 cts. a lb., from a cow weighing about 1,000 lbs. live weight, on no more food than it would take to produce 750 lbs. of matured meat, live weight, in an equal space of time, worth 5 cts. a lb., points out distinctly to that side on which the profit lies—between dairying and meat raising*.

Let us now, if you please, ask our Federal Government for the dissemination of all such practical knowledge as will increase the profits of Canadian farmers, on all subjects pertaining to agriculture in general, and also show us clearly where our future markets lay, and we can, hopefully, let the future of Canadian dairying rest with our intelligent Canadian dairymen.

* Experiments made with great care in Denmark, on large herds, where the food was weighed carefully during a whole winter, proved that the feed required to produce one pound of matured flesh, live weight, actually produced, on an average of forty-six animals, 21 lbs. of milk, from which two-thirds of a pound of butter and one and one-third of a pound of cheese (partially skimmed) were made. *See* "Journal of the Royal Agricultural Society of England," vol. xii, page 341.

A.—Complete Synopsis of Agricultural Statistics Extracted from Census of 1881.

Definition.	Prince Edward Island.			Nova Scotia.			New Brunswick.			Quebec.		
	Quantity.	Acres.	Average per Acre.	Quantity.	Acres.	Average per Acre.	Quantity.	Acres.	Average per Acre.	Quantity	Acres.	Average per Acre.
Land occupied	1,126,653	Pasture p. head. (4)		5,396,382	Pasture p. head (4)		3,809,621	Pasture p. head. (4)		13,625,877	Pasture p. head. (4)	
do improved	596,731			1,880,644	1·82¼		1,253,299	1·13¼		6,410,264	1·31	
do under cultivation	467,211	·69½		942,010			849,678			4,147,984		
do in pasture	126,935			917,010			392,169			2,207,422		
do garden and orchard	2,285			21,624			11,452			54,858		
Total population	108,881			440,572			321,233			1,359,027		
Occupying less than 11 acres	1,188			12,471			4,827			19,159		
do 51 do	4,280			13,536			8,826			24,564		
do 101 do	5,087			14,504			13,323			47,686		
do 200 do	2,517			10,742			6,748			34,723		
Occupying over 200 do	587			4,620			3,111			11,740		
Total occupants	13,629			55,873			36,837			137,863		
Horses (1) $60	25,182			46,044			43,957			235,006		
Colts $40	6,153			11,123			9,018			48,848		
Working oxen	84			33,275			8,812			49,233		
Oxen, slaughtered, living, &c. $25	15,200			63,389			35,414			160,207		
Milch cows $25	45,895			137,639			103,965			990,967		
Other cattle $15	44,743			154,689			99,786			490,119		
Sheep, alive $5	166,496			367,811			221,163			889,833		
do slaughtered $5	58,872			151,245			93,743			436,336		
Pigs, alive $9	40,181			47,256			53,089			329,199		
do slaughtered $15	26,836			56,259			59,904			333,159		
Total equivalent in cattle (2)	182,224	(4)	Head. 3·26	503,567	(4)	Head. 3·69	346,195	(4)	Head. 3·59	1,680,529	(4)	Head. 3·78
Butter, hand made $0 15	1,638,690			7,465,285			6,527,176			30,630,397		
do creamery $0 24				501,657								
Cheese, hand made $0 08	196,273			501,657			172,144			559,268		
do factory $0 09												

Wheat, Spring, bushels	1 00	546,872	41,942	Bush. 13 3/70	522,602	43,045	Bush. 11⅘	517,997	40,831	Bush. 12·56½	1,[illegible],815	224678	Bush. 8·9[illegible]
do Winter do	1 00	114			6,[illegible]			3,959			19,189		
Oats do	0 40	3,538,219	....	14·23	1,873,[illegible]	....	8·09	3,297,534	....	13·88	19,990,205	....	12·77
Barley do	0 60	119,368	....		228,748	....		84,183	....		1,751,539	....	
Rye do	0 75	307	....		47,567	....		18,268	....		430,242	....	
Pease and Beans do	0 80	3,169	....		37,220	....		43,121	....		4,170,456	....	
Buckwheat do	0 50	90,458	....		339,718	....		1,587,223	....		2,041,770	....	
Indian corn do	0 60	2,603	....		13,532	....		18,159	....		880,169	....	
Potatoes, bushels	$0 40	6,042,191	39,083	154·59	7,378,387	60,192	122.60	6,961,016	51,362	135·33	14,873 287	12[illegible]69	120·07
Turnips do (6)	0 10	1,198,407	2,482	500	1,006,711	2,865½	500	990,336	2,293	500	1,572,476	7,246½	500
Other roots do (6)	0 20	42,572			326,143			159,014			2,050,904		
Flax seed do (3)	1 00	919	92	....	1,793	179	....	7,745	1,745	....	65,995	6,599½	....
Seed, Timothy and Clover, bushels	2 50	15,247	....	....	8,128	....	....	7,527	....	....	119,306	....	....
Hay, per ton	6 00	143,981	119,936	Tons. 1·20	587,731	519,856	Tons. 1·14⅔	414,046	389,721	Tons. 1·06	1,614,106	1 495,494	Tons. 1·08
Apples, per bushel	0 35	31,501	....	....	908,519	....	....	23[illegible],096	....	....	777,557	....	....
Grapes, per lb	0 04	795	....	....	35,015	....	....	2,108	....	....	158,031	....	....
Other fruit, per bushel	0 50	2,547	....	....	18,485	....	....	6,122	....	....	155,543	....	....
Maple sugar, per lb	0 08	25,098	....	....	217,481	....	....	453,124	....	....	5,687,835	....	....
Tobacco do	0 15	1,367	....	....	1,216	....	....	6,414	....	....	2,356,581	....	....
Hops do	0 10	10,209	....	....	1,143,440	....	....	15,006	....	....	218,542	....	....
Honey do	0 10	552,083	....	....	18,677	....	....	760,531	....	....	2,730,546	....	....
Wool do	0 25	14,945	....	....	24,500	....	....	78,203	....	....	559,024	....	....

A.—Complete Synopsis of Agricultural Statistics, &c.—*Continued.*

Definition.	Ontario.			Manitoba.			British Columbia.			Territories.			Grand Totals for the Dominion.	
	Quantity.	Acres.	Av'ge per Acre.	Quantity.	Acres.	Av'ge per Acre.	Quantity.	Acres	Av'ge per Acre.	Quantity.	Acres.	Av'ge per Acre.	Quantity.	Value.
		Pasture p. head.			Pasture p. head.			Pasture p. head.			Pasture p. head.			$ cts.
Land occupied	19,259,909	(4)	.....	2,384,337	(4)	.....	441,255	(4)	.....	314,107	(4)	.....	45,358,141	.....
do improved	11,291,199		.....	250,416		.....	184,885		.....	28,883		.....	21,899,181	.....
do under cultivation	8,370,266	·85½	.....	230,264	·2⅝	.....	83,657	·86	.....	21,214	·31	.....	15,112,284	.....
do in pasture	2,619,098		.....	17,197		.....	98,457		.....	7,334		.....	6,395,566	.....
do garden and orchard	324,805		.....	2,955		.....	2,771		.....	285		.....	401,335	.....
Total population	1,923,225	.....	.....	65,954	.....	.....	49,459	.....	.....	56,446	.....	.....	4,324,810	.....
Occupying less than 11 acres	36,221	.....	.....	284	.....	.....	1,013	.....	.....	132	.....	.....	75,286	.....
do 51 do	41,497	.....	.....	300	.....	.....	291	.....	.....	26	.....	.....	93,335	.....
do 101 do	75,282	.....	.....	579	.....	.....	195	.....	.....	16	.....	.....	156,672	.....
do 200 do	42,476	.....	.....	4,046	.....	.....	666	.....	.....	325	.....	.....	102,213	.....
Occupying over 200 do	11,513	.....	.....	3,868	.....	.....	575	.....	.....	515	.....	.....	36,499	.....
Total occupants	206,989	.....	.....	9,077	.....	.....	2,743	.....	.....	1,014	.....	.....	464,025	.....
Horses (1) $60	473,906	.....	.....	11,504	.....	.....	20,172	.....	.....	9,081	.....	.....	857,855	51,471,300 00
Colts 40	116,392	.....	.....	2,235	.....	.....	5,930	.....	.....	1,786	.....	.....	201,507	8,060,120 00
Working oxen	23,263	.....	.....	12,369	.....	.....	2,319	.....	.....	3,334	.....	.....	132,593	3,977,790 00
Oxen, slaughtered or living $25	363,043	.....	.....	4,936	.....	.....	12,696	.....	.....	1,796	.....	.....	657,581	16,442,025 00
Milch cows 25	782,243	.....	.....	20,365	.....	.....	18,878	.....	.....	3,848	.....	.....	1,595,800	39,895,000 00
Other cattle 15	896,661	.....	.....	27,657	.....	.....	67,234	.....	.....	5,690	.....	.....	1,786,596	26,798,940 00
Sheep, alive 5	1,359,178	.....	.....	6,073	.....	.....	27,788	.....	.....	346	.....	.....	3,048,678	15,243,390 00
do slaughtered 5	748,972	.....	.....	1,382	.....	.....	10,683	.....	.....	232	.....	.....	1,496,465	7,482,325 00
Pigs, alive 9	7,922	.....	.....	17,358	.....	.....	16,841	.....	.....	2,775	.....	.....	1,207,619	10,868,571 00
do slaughtered 15	796,548	.....	.....	18,674	.....	.....	10,411	.....	.....	712	.....	.....	1,302,503	19,537,545 00
Total equivalent in cattle (2)	3,049,770	(4)	Head. 3.63	80,513	(4)	Head. 3.07	194,592	(4)	Head. 1.81	23,072	(4)	Head. 1.23	.....	.....
Butter, hand made $0 15	54,862,365	.....	.....	957,152	.....	.....	343,357	.....	.....	70,717	.....	.....	102,545,169	15,381,775 35
do creamery 0 24	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Cheese, factory 0 09	1,701,721	.....	.....	19,613	.....	.....	33,252	.....	.....	1,060	.....	.....	3,184,936	254,799 68
do hand made 0 08	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

				Bush.			Bush.			Bush.			Bush.		
Wheat, Spring, bushels ...	1 00	7,213,024	1,949,135	14·01	1,029,378	51,293	20·15	153,485	7953	21·84	119,644	5678	21·07	12,102,817	12,102,817 00
do Winter do ...	1 00	22,193,067			4,296			20,168			11			20,247,452	20,247,452 00
Oats do ...	0 40	40,209,923	....	17·08	1,270,268	....	20·84	253,911	....	8·95	54,952	....	16·80	70,473,131	28,201,252 40
Barley do ...	0 60	14,279,841	....		253,604	....		79,140	....		48,445	....		16,844,868	10,106,920 80
Rye do ...	0 75	1,598,871	....		1,203	....		482	....		240	....		2,097,180	1,572,885 00
Pease and Beans do ...	0 80	9,434,872	....		8,991	....		50,542	....		1,291	....		13,749,662	10,999,739 60
Buckwheat do ...	0 50	841,649	....		320	....		59	....		50	....		4,901,147	2,450,573 50
Indian corn do ...	0 60	8,096,782	....		2,516	....		1,433	....		1,948	....		9,025,142	5,415,085 20
Potatoes, bushels	0 40	18,893,996	181,394	104·15	556,193	4,306	129·18	473,831	3,272	147·87	89,326	811	110.14	55,268,227	16,580,468 10
Turnips do (6)	0 10	33,856,721	80,672	500	143,025	396	500	270,535	905½	500	14,893	36	500	39,059,094	3,905,909 40
Other roots do (6)	0 20	6,479,222			49,096			82,249			3,091			9,192,320	1,838,464 00
Flax seed do (3)	1 00	38,208	3,820	....	....	....	....	34	3	....	....	....	....	108,694	108,694 00
Seed, Timothy and Clover	2 50	173,219	....	....	303	....	....	857	....	....	....	....	....	324,317	810,792 50
				Tons.			Tons.			Tons.			Tons.		
Hay, per ton	6 00	2,038,659	1 795,965	1·14 5/12	185,279	100,591	1·84	43,898	28,449	1·52½	17,500	8,337	2·10	5,055,810	30,334,860 00
Apples, per bushel	0 35	11,400,517	....	....	193	....	....	28,100	....	....	175	....	....	13,377,655	4,682,179 25
Grapes, per lb.	0 04	3,697,555	....	....	13	....	....	2,961	....	....	30	....	....	3,896,508	155,860 32
Other fruit, per bushel ...	0 50	644,707	....	....	1,483	....	....	12,347	....	....	....	....	....	20,556,049	420,609 00
Maple sugar, per lb	0 08	4,169,766	....	....	2,796	....	....	9	....	....	....	....	....	....	....
Tobacco do	0 15	160,251	....	....	2,037	....	....	96	....	....	....	....	....	2,527,962	379,194 30
Hops do	0 10	615,967	....	....	1,835	....	....	24,899	....	....	72	....	....	905,207	90,520 70
Honey do	0 10	6,013,216	....	....	16,452	....	....	85,148	....	....	32	....	....	11,360,736	2,825,184 00
Wool do	0 25	1,197,628	....	....	1,080	....	....	365	....	....	....	....	....	1,874,745	187,574 50

(1). The prices indicated are purely conjectural, there being nothing positive to guide us in the estimate we have made; nevertheless, they are based on the best information we have, and are put at the very lowest figure, in order to show the approximate total of the value of stock and crops.

(2). I have established this equivalent by counting 2 colts, 2 head of cattle other than working cattle and cows, 5 sheep and 3 pigs, as equivalent to 1 horse, 1 bull and 1 cow.

(3). The Census only gives the total (bushels) of grain harvested, without giving the number of acres covered by each kind. In order to find the average per acre we have added all the grain harvested, other than wheat, and taken average per acre for all the land under cultivation, less that under hay, vegetables and flax. This is the average in bushels given for the grain mentioned. Flax seed is estimated at 10 bushels per acre.

(4). Unfortunately the Census does not distinguish between farm stock proper and other animals of like species belonging to non-farmers. Hence it is impossible to ascertain how many head of large stock the farmers keep per 100 acres of land, and how much pasture is needed per head. The figures we have given show that the Census is of no value as a complete collection of agricultural statistics.

(6). The number of acres in roots, other than potatoes, is given on the supposition that each acre has yielded 500 bushels. I have made this estimate in order to ascertain approximately the number of acres and the yield per acre of the same crop, as the Census does not give it.

DEPARTMENT OF AGRICULTURE AND PUBLIC WORKS,
QUEBEC, 18th March, 1884.

ED. A. BARNARD,
Superintendent of Agriculture.

To the Special Agricultural Committee at Ottawa:

ONTARIO AGRICULTURAL COLLEGE AND EXPERIMENTAL FARM,

28th February, 1884.

GENTLEMEN,—I have the honor to acknowledge the receipt of your favor of the 18th inst., in which you desire certain information, by a series of questions, as to the best means of encouraging and promoting the agricultural interests of the Dominion.

It affords me much pleasure to respond to this invitation, and the single regret is that writing does not impress the importance of a point so well as verbal explanation.

I shall take up the subject in the order given in your communication.

(*a.*) "Give the Committee your opinion of the results of your Experimental Farm upon the agricultural and stock-raising interests of Ontario?"

While it takes more time to evolve anything in farm cropping than in live stock development, this farm, by its ordinary practice, as well as through purely scientific research, has already done considerable for the country. In practice, it has introduced and distributed several new cereals that have stood their time fairly well. And the value of this subject is now more evidenced than it ever has been, by the fact that, with no wheat, oats or barley on hand to recommend, the very numerous applications for them are causing disappointment. So strong has this feeling become that I have just forwarded a recommendation to the Ontario Legislature, of which the following is an extract:—

"Ontario may have to take a second place in the extensive and cheap productions of cereals, because the possession of the country westwards being in some respects a repetition of our own life, will produce cheaper and maintain plant excellence better than older lands can do. This new feature of our Dominion agriculture must be acknowledged in Ontario practice, and that practice made to tie with it. This position does not imply that Ontario must give up her wheat area or that, the proper maintenance of varieties must be abandoned. I think, on the contrary, that it devolves upon us more than ever to give attention to these. Under the increasing fertility of our older lands, by the better system of farming and larger number of live stock kept per acre, Ontario is as able as ever to grow perfect wheat—both winter and spring varieties. The fine old Soule and Fife have left us meantime—not for want of proper norishment in climate or soil, but simply because in the regular course of their day, as cultivated plants, they require a change. We did not allow them that thorough recuperation by change to other climates and soils which alone affords new life, and hence serious disappointments and loss, that are too often ingnorantly charged to other causes. It comes as an interesting point in these considerations whether our North-West Territories will send us back the Fife, Club and white Russian, so reinvigorated as to give another lease of a quarter of a century. Meantime something else must be done."

"It is considered to be the duty of the Legislature in connection with this experimental station, to maintain a system of grain testing for ourselves as well as others. I am of opinion that Ontario, by all her physical conditions, is better adapted for this purpose than any other position on the American continent. European and United States experience say that the change of seed most suitable for them and us is from Southern Russia and Hungary, which have a climate in more respects resembling Canada than any other country. The isothermal of 45° joins Ontario and the Black Sea district, which is still so famous for sound wheats.

"A good deal has been attempted during the last ten years in introducing new wheats from the United States, both by private enterprise and this Experimental Farm, but, with few exceptions, they have failed, or were but short lived. This was a natural consequence of bringing from the south to the north. The work must be accomplished through equal, or more severe climatic conditions, than the country proposed to be benefitted, so that further attempts from the United States may be looked upon as fruitless. We should at once begin the purchase of

wheat from Europe, not only for experimental testing here but immediate distribution throughout the Province. For this purpose I ask that $3,000 be placed in the Estimates for 1884, and that means may be taken for a proper selection by a competent person, so that the fall of 1884 and spring of 1885 may be fully provided for in chosen parts of the Province."

From this your Committee will realize how much importance is still attached to the proper maintenance of cereals. Then again, this station has very prominently drawn the attention of farmers to the importance of permanent pastures, and by a careful series of trials has now shown what varieties of grasses and clover are best for the purpose. The result is that very many in other Provinces as well as Ontario, have followed our directions with a most gratifying success. The success has been such as to call forth high commendations at public meetings, and a Senator of the Dominion lately said to the writer, that what the Ontario Experimental Farm had done in this respect goes a long way to cover all its expenses.

So also in regard to green fooder as aids to pasture, and special lines of feeding, this farm has very distinctly shown what can be done by the average farmer. In the case alone, of the clover called Lucerne, we have many followers who are much satisfied with the results. These, among others, are evidence of what we have done in farm cropping.

In more pure experimental work our record has been, as yet, introductory and questioning—the inevitable of all experimental stations with a nine years' history only.

The great question of the times, in Europe especially, is the value of special fertilizers. To this we have devoted more than ordinary attenion. The future may show something that is at present undeveloped in our experience, but meantime I take the position that the light thrown on our practical tests in the use of apatite, gypsum, and others, in the production of farm crops, goes to establish what might be matter of gratification to the country—that its wonderfully fertile climate, in conjunction with system and the best management and use of farm yard manure, renders the extensive use of special fertilizers comparatively valueless. I am aware that such an opinion will be challenged, and many cases cited in contrary proof, but in this, as in other things, marked exceptions are not wanting.

In making prominent the stock raising interests of the country our farm has not only done more than among crops and manures, but has actually held the lively interest of the United States, Australia, and Europe, during the last eight years. This has resulted from :—

1. Introducing new breeds of cattle not previously known in the Province.
2. In feeding and fattening their crosses with the common cattle, upon sound scientific and practical basis.
3. In pointing out their special properties and adaptability to particular objects.
4. In so breeding and feeding the pure breeds for sale as to command the confidence of the people.

As the agent of the Ontario Government in this work, I have been highly gratified at the success, and the response thus furnished is but a touch of the immense field open to the Dominion. As part of the same, we have been making careful experimental tests as to the value of many forms of feeding materials, not only with those at home, but others from Europe and the States, so that to date we hold some facts of practical importance in connection with the maintenance of animal life, particularly during our very distinct winters.

I beg your acceptance of the two following tables, which show the place we give to the most prominent breeds of cattle and sheep :—

STANDING of Leading Breeds of Cattle as recognized in 1884

	BEEF.					BEEF AND MILK.			MILK.			
STANDARD POINTS OF CATTLE.	Maximum Value.	Short Horn.	Hereford.	Aberdeen Poll.	Galloway.	Maximum Value.	Devon.	Norfolk and Suffolk Polls	Maximum Value.	Dutch.	Ayrshire.	Jersey.
1. Early Maturity	200	200	180	195	125	140	130	140	75	75	60	55
2. Permanency of Character	100	80	90	68	100	85	85	70	70	63	65	70
3. Weight of Flesh	150	150	134	143	110	100	85	100	70	70	50	35
4. Constitution	50	40	50	36	46	50	45	50	50	50	43	30
5. Freedom from Disease	60	50	60	48	57	60	60	55	60	60	50	57
6. Impressive Power	40	40	35	35	33	40	40	25	40	40	33	35
7. Reliable Breeder	60	48	60	50	58	60	60	54	60	60	55	56
8. Hardiness	60	40	55	45	60	55	55	48	50	45	50	30
9. Quality of Flesh	30	18	22	24	30	25	20	25	20	13	20	18
10. Forager	40	27	37	30	40	40	40	37	40	34	40	27
11. Disposition	35	35	28	33	24	50	50	38	60	55	48	60
12. Good Mothers	25	20	25	21	23	25	25	20	25	23	19	25
13. Least Offal	20	17	20	18	20	15	13	15	10	10	9	8
14. Quantity of Milk	60	60	55	53	50	130	110	130	200	200	185	100
15. Quality of Milk	25	25	20	22	20	65	65	50	100	50	30	100
16. Cost of Production	45	42	45	44	36	40	35	40	40	40	35	28
17. Long Use	.....	.....	.....	.....	.....	20	20	17	30	30	25	20
	1,000	892	916	865	832	1,000 Subject to explanation.	938	914	1,000	913	817	754

(*b.*) "Do you consider that like beneficial results would follow to Canada as a whole, from the establishment of a farm by the Dominion Government?"

I do not; the Provinces separately are so much more directly interested, and able enough, both in means and enterprise, and can so much better give immediate superintendence as to set aside the help of the Dominion Government." But while actual special example is, in my opinion, unnecessary in this respect, precept and help otherwise would well become the parental position of Ottawa. This could take the form of:—

1. Collection and distribution of experimental work in other parts of the world;
2. Donations of seeds, manures, trees, books and kindred things to Provincial experimental stations
3. Suggestions as to the direction of any particular line of enquiry at these stations.
4. And particularly the granting of lands or money for purposes of endowment of provincial institutions.

The three first will be referred to in subsequent notes; but here I beg very earnestly to impress upon your Committee the great power in the hands of the Dominion Government, from the possession of immense tracts of unsettled lands that could so appropriately be granted to agricultural colleges and experimental farms, in order to place them in permanent independence. I can conceive of no more appropriate application of the soil of the nation.

(*c.*) "What, in your opinion are the disadvantages under which our farmers labour, with respect to stock-feeding and raising, sheep-farming, production of butter and cheese, and the proper use of fertilizers, and in what way could an Agricultural Bureau, sustained by the Dominion Government, help to remove those disadvantages?"

STANDING OF
LEADING BREEDS OF SHEEP
AS RECOGNISED IN 1884.

STANDARD POINTS OF SHEEP.	Maximum Value.	Lincoln.	Cotswold.	Leicester.	Cheviot.	Oxford Down.	Hampsh're Down.	Shropshire Down.	South Down.	Merino.	
1. Early maturity	200	150	140	200	100	180	170	170	180	70	.....
2. Weight of Fleece.....	150	150	140	120	60	135	130	125	80	100	.....
3. Permanency of Character...	80	40	50	35	70	30	60	55	75	80	.....
4. Quality of Wool.....	70	40	37	48	30	50	60	58	65	70	.....
5. Weight of Flesh	50	50	45	40	28	38	35	33	25	20	.....
6. Constitution	50	25	40	40	33	45	35	30	30	20	.....
7. Freedom from Disease.....	50	33	33	20	35	30	45	40	50	25	.....
8. Impressive Power	40	20	25	35	25	15	30	27	40	33	.....
9. Reliable Breeder.....	40	23	25	20	30	40	35	35	38	15	.....
10. Hardiness	40	20	30	15	38	30	35	35	40	25	.....
11. Quality of Flesh.....	30	15	18	12	25	22	28	28	30	10	.....
12. Prolificness	30	18	20	15	15	30	25	25	28	10	.....
13. Forager	30	15	18	10	30	20	23	23	25	25	.....
14. Disposition.....	20	12	10	18	8	20	15	15	13	7	.....
15. Good Mothers.....	20	12	12	7	10	18	15	15	20	7	.....
16. Least Offal.....	20	7	9	20	8	12	15	15	10	8	.....
17. Length of Wool.....	20	7	8	10	10	12	15	15	18	20	.....
18. Uniform Fleece.	40	30	28	20	20	25	35	33	35	40	.....
19. Cost of Production.....	20	7	10	20	10	18	15	15	15	12	.....
	1,000	674	698	715	585	770	821	792	837	597	

This is a wide question and could well command a treatise for itself. It has four parts; those very briefly:—

The stock-raising and feeding disadvantages are, want of better pasture—such permanent pasture as the Ontario Experimental Farm has shown can be so easily established and maintained—able to keep one and one-fourth cattle beast per acre in place of three acres of the present stamp being required for one animal.

Want of better tree shelter.

Want of more pure-bred males.

Want of knowledge of adaptability of breeds to particular conditions throughout the Dominion.

I am so satisfied of the adaptability of parts of our Dominion to the production of mutton and wool on the large and cheap scale—in the North-West Territories and Eastern Provinces—that in December last I made a specialty of the subject in an address at St. John's, N.B.

The butter industry of Quebec and the cheese industry of Ontario, as recognised by their respective Governments, are no doubt well known to you, and I opine that in these as in the case of experimental farms referred to, direct Dominion help is not necessary. The disadvantages in the production are obviously want of strict scientific and practical details of manipulation; nothing else, because all our rural economy clearly indicates the permission of a large proportion of its area to such products.

I have elsewhere submitted my opinion as to the use of fertilizers. Let me add further, that as a progressive nation we must keep a strict eye to their future—especially in connection with the increasing area of permanent pasture and very possibly the demand for their use in the top-dressing and the improvement of much of the great ranches of the North-West.

An Agricultural Bureau, I think, could not meet these disadvantages practically. It would help by monthly issues, keeping farmers informed as to markets, quantities on hand, and kindred information, which, after all, are not unknown to the keen man of business. However, in this line, I have to say something in another place.

(*d.*) "Do you think the importation and distribution of seeds, plants and scions would be beneficial, and would it be necessary that these be first tested on an experimental farm before distribution?"

I am of opinion that under this question we have the most important indication of what the Dominion Government should do for the agriculture of the country. The subject is tree culture.

Nothing has such a Dominion significance as this. It is, of all things, in our present rural economy, the biggest want, the unseen danger of the Dominion. It is not, in its widest sense, a personal duty, nor a sectional interest, nor even a provincial one. The scientific and practical bearings of arboriculture embraces the whole sweep of a country, however extensive, because it is not alone the roadside shade tree, the belt of timber, the special clump or the sectional plantation that is wanted. The amelioration of our climate by tree surface, and the extensive economical cropping of them, is clearly a thing of the Dominion Government.

I presume it is unnecessary to elaborate on the importance of conserving parts of the present forest lands, or to show that re-planting is absolutely necessary in other parts and assuming that your Committee would rather confine its advice to what is more directly under Dominion control, I presume there is field enough in the great North-West for the exposition of practical arboriculture.

My experience as a British forester from 1850 to 1871, in draining and enclosing forest lands, rearing trees from seeds, and planting over 15,000,000 of them, and also having had to assist in establishing the claims of arboriculture as a science in connection with the British Association for the Advancement of Science, all go for nothing if I do not see that our magnificent West will never hold the grannary, nor the flesh larder of the world, as it should, until it also becomes the source of wood revenue by annual thinnings. It can be done. It would not be difficult to do. What to do, permit me to indicate by a list of subject headings:—

1. The establishment of two or more stations as nurseries throughout the North-West, with houses for laborers and foremen, and enclosures suitable for production of trees, both from seed and by purchase.

2. The careful testing of varieties of trees native and foreign to Canada.

3. The gradual and systematic choice of positions for plantations, their fencing, and such cultivation, preparatory to tree planting, as may be deemed necessary.

4. The immediate recording, by Statute of the Dominion, of power by Government to resume any part of land leased or sold, or to be leased or sold, for purposes of tree planting.

5. The gift of trees to settlers, upon conditions.

6. The annual planting and care of the trees upon the best known principles of science and practice.

7. The appointment of a Forest Conservator—directly responsible to Government.

Examples are not wanting to build upon in all these—in Europe, India and Australia. In Australia one of my brothers is conservator, and his seven years' work, to date, has produced results surprising and most gratifying. Why should Canada hesitate. Are we waiting to know that, independently of climatic influences, there is actually more annual revenue to be derived from a tree crop, under good management, than by any other form of produce whatsoever.

(*e.*) "Would the collection and distribution, of agricultural information and statistics be of advantage to farmers of the Dominion, and how would you advise as to both collection and distribution so as to ensure the maximum of reliability and benefit?"

Most certainly. The Dominion, I think, should act as a centre for all the Provinces receiving their statistics, analysing them and distributing according to relative importance. Provinces should best manage their own agricultural materials, but their distribution by the Dominion would tell better in the eye of the world, would give every Province a better status, as being Canadian, less partial and presumably more reliable.

(*f.*) "What do you think of the advisability of appointing an expert analyst of soils and fertilizers, to whom samples could be sent, and from whom exact information as to quality and utility could be had?"

I think we are not yet ripe for this. Its consideration may well be taken up about the year 1900. We have pioneering, reclamation, reafforesting, and a settled agricultural economy to do, that will demand our full efforts, without the exact scientific helps indicated, and which belongs to an older state of things than Canada yet possesses.

(*g*). "What could be done in the matter of the collection and publishing of valuable information in handbooks and treatises?"

There is more practical and important to the farmer and country generally than the previous question. Governments in new countries ought to be teachers, and one of the best forms of reaching the older members of the community is by printed matter. I can conceive of no better way of expending $10,000 annually than by the employment of one expert, who, quarterly at least, would submit such choice agricultural literature in pamphlet form, not too massive, as would command the confidence of our farmers. I would not advise its free destribution, but at a charge of say 25 cents per copy.

(*h.*) "Has the publication of the Report of the Agricultural Commission of Ontario proved beneficial to the farming and producing interests of that Province?"

To a very large extent indeed, and this is evidence enough, for the prosecution of the previous question. Not only has their agricultural report disseminated knowledge of direct practical value, but it has given the Province a status in the eye of the world that is already doing a great good Now, I am of opinion that were the Government to issue annually a succinct, well arranged and readable report on the whole industries of the Dominion, the effect would be full. It would have to be crisp, semi-entertaining, partly historical, up to time, and smart in its issue.

Allow me to ask the question, if your Government is now preparing such a digest in view of the visit of the British Association for the advancement of science, which, as you may be aware embraces in its own enquiries—statistics, mechanics, geography, physiology, zoology, botany, geology, chemistry, physics, mathematics, arboriculture and agriculture? If not, we will surely be found wanting.

(*i.*) "What measures could be adopted by the Dominion Government to secure an improvement in the raising of stock?"

This is not easily answered because of its great importance, and of the great field covered. As a people, we live on flour, flesh and fruit, and if flesh be second to flour in importance, it is now, at any rate in the older Provinces, the back-bone of flour. What can we do to make our farmers realize the difference between breeds—between pure breeds and grades—and that Canada all over is a splendid field for their most perfect and economical development. The subject has two aspects: the production of thoroughbreds for ourselves and the American market, and of grades partly for ourselves and largely for the British market. I may be too warm on these to give what may be called an impartial opinion, for I have always contended that as Canadians we have not yet realized how much we can do as a country in these particulars.

No part of the American continent can compete with us in the healthy maintenance of cattle and sheep, and were our farmers alive at the present moment to what is going on in the United States as preparatory to an almost universal bonanza in beef and mutton, they would surely waken up—for I do not think we want for enterprise—once realized. I see no reason why Canada should not place and hold herself as the sole breeding ground for the United States. The Americans themselves think so. They act upon this belief and yet we do not seem to see it.

I beg your indulgence for those remarks, for I feel more upon this weakness of our business than anything else. What can be done?

I think your Government can help very materially.

1. Good as our quarantine has been, I would advise the appointment of an efficient officer at Liverpool, with power to admit no animal on board ship destined for Canada, that has the slightest symptom of any infectious or contagious disease. He could easily overtake the like duty at other British ports.

2. I would establish, under the Commission of Agriculture at Ottawa, a branch office, where every breeder of pure, bred cattle, sheep, horses and swine throughout the Dominion, would be invited to register their name, address and classes of animals on hand annually, in order that those in search of stock might readily, and at no expense, obtain information.

3. The Government should institute an extensive and systematic series of prizes for the best managed herds and flocks, the conditions to be of the most strict, far-reaching, and yet easily admissable sort. Reports upon the same to be included in question (*g*).

I have the honor to be, Gentlemen, your obedient servant,

WM. BROWN.

Estimate of Annual Maintenance of an Agricultural College and Experimental Farm.

Cr.			THE AGRICULTURAL COLLEGE.		Dr.
	$	$		$	$
Fees of 100 students	5,000		Salaries of five teachers	6,000	
Students' board charge	7,500		Management of College	1,700	
		12,500	Boarding house management	1,900	
Balance to debit		10,600	Boarding house expenses	10,500	
			General repairs	3,000	
		23,100			23,100

THE EXPERIMENTAL FARM.

(400 Acres cultivated.)

	$	$		$	$
Revenue from sale of Live Stock, Wool, Grain, &c., &c.		4,700	Salaries of three Foremen Teachers	2,100	
			Wages of four Ploughmen	1,440	
Balance to debit		2,640	Wages of Cattleman and Shepherd	800	
				4,340	
			Special Manures, Seeds, Blacksmith, Harness, Medicine, Fuel, Printing, Implement repairs, &c., &c.	3,000	
		7,340			7,340

WM. BROWN.

MONTREAL, 11th March, 1884.

DEAR SIR,—We would like to add to the remarks we have made on your printed form, that there is a general deficiency in the manufacture of cheese in the Province of Quebec, and in some parts of Ontario, but this is traceable to the rapidity of the growth of the manufacture and, no doubt, as the makers get more experienced they will make better quality and as the farmers grow wealthy they will be willing to put up better buildings and pay better prices for everything that is used about the factory. The matter requiring immediate and urgent attention is that of better boxes. We do not think the Government is aware of the importance of the manufacture of cheese. We were pleased to note the remarks of Mr. Arnold before your honorable Committee the other day, but Mr. Arnold has by no means stated the whole facts of the case. The total exports of cheese for the last six years from Canada have gone on increasing with wonderful rapidity, until during 1883 over 1,000,000 boxes of cheese, amounting to about $7,500,000, besides nearly $2,000,000 worth of butter, has been sent out of the country. The peculiar situation of Canada, in this cool climate, puts us in the same position as Denmark and Sweden, and leaves it without question that there is no place in the world that can rival us in the production of both butter and cheese. If the Government desires to foster the larger make and better quality of cheese, we would respectfully suggest that it can best be done by employing skilled, practical makers of cheese, to go about the country among the factories giving them instructions; this has been done to some extent in Ontario with commendable results, but we think a considerable improvement can be made on the system there, and, with no disrespect to Prof. Arnold and men in similar positions, our experience of some twenty years (and permit us to add, that during that time we have been by far the largest exporters of butter and cheese from Canada, and perhaps from this continent) has led us to believe in the instructions of good practical makers, who have a well-known reputation, and are always successful in making the finest cheese. We feel positively certain that three men in Ontario, and three men in the Province of Quebec, employed at a salary not to exceed $1,000 per annum including all travelling expenses (we mean, each person to pay his own expenses out of the $1,000) would result in a value of $50,000 to $100,000 to the country, and possibly twice this amount. If it was thought best we would submit to you a plan of work for this season: lay out the Province of Quebec in sections for each man, and we think we could suggest men who would give unbounded satisfaction, both to the Government and to the factories; for the Province of Ontario, the Dairymen's Association have already this matter in good control.

Butter.—The manufacture of butterine and oleomargerine in the United States has caused an almost entire cessation of demand for the ordinary grades of butter, or for over-kept and stale lots. It is therefore altogether likely that the store-packing of butter, so prevalent in many parts of Ontario, will almost entirely cease, simply because there will be no demand for it. We see no way to stop the large losses that will occur to merchants and farmers during the probable transition of the making of the butter by the farmers, to its being made in factories, after the present system that cheese is made on. There are a few creameries in Canada at the present time, but these few are going through the same experience that the manufacture of cheese did about twenty years ago, and until more factories are established and the make becomes very much larger, the profits will be, comparatively speaking, smaller than could be desired. For the above reasons the butter problem in this country is a much more difficult one than that of cheese. We would suggest that if the Government desires to foster the building of butter factories or creameries, that it do so by giving a bonus of a certain sum of money, say $1,000 to each factory, which shall be established under fixed regulations; for the present, this might be limited to one factory in each county, and not more than one-third to one-fourth of the counties in Ontario and Quebec are butter-making counties. Say that the building shall be of a certain style of construction, furnished satisfactorily; that it must run for a certain

number of years, with a certain number of cows; that the maker must receive a certificate from a Committee qualified and appointed to examine, &c, &c.

We hope we have made ourselves plain in the above, and shall be glad to answer any further questions you may choose to ask us.

We remain, yours respectfully,
A. A. AYER & CO.

G. A. GIGAULT, Esq., M.P.,
Chairman, Committee on Agricultural Industries,
House of Commons, Ottawa.

LANCASTER, CANADA, 18th March, 1884.

DEAR SIR,—I herewith enclose your statement filled out to the best of my ability. Had I more time to deliberate on the different questions I might answer them more fully, but this being my busiest season, I hope you will overlook any omissions I may have made, and I will always be pleased to give any information that lies in my power to further the industries and welfare of our country, and especially in the agricultural and dairy line,

Yours truly,
D. G. McBEAN,

G. A GIGAULT, Esq., M.P.,
Chairman, Committee on Agricultural Industries,
House of Commons, Ottawa

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1. The greatest difficulty the farmer labours under is exhausted land and a lack of knowledge of the relative value of manures and the proper means to obtain the best fertilizers, pure. 2. Wheat is a failure; oats, barley and other grains, good crop. (2.) Not much roots grown; grass, good crop. (3.) Want of improved male animals. (4.) Low average of milk per cow. (5.) Culture of fruit, none worth mentioning in this section. (6.) Barnyard manure losing its main strength by being exposed to leaching rains; some land plaster. 3. Very much if they can be relied on. 4. Yes, if a satisfactory system could be adopted. 5. Think it would. 6. Very great. 7. Very advisable. 8. Sometimes crows and black birds are troublesome in spring and fall, but not much to speak of. 9. Wheat, from fly. 10. None. 11. No details. 12. None. 13. I think it would. 14. Consider the present quarantine to severe; it prevents many persons importing improved cattle for breeding purposes. Would suggest the present system be much modified and changed, as no person would import any animals infected and run the risk of loss to themselves and others. The present system is too expensive and too few stations for quarantine. 15. Quite sufficient. 16. None. 17. None. 18. The establishment of a Central Bureau would be a very valuable and useful establishment, and would tend to further the interests of farmers very much. 19. This is a much needed reform, and should be very beneficial. 20. Would strongly recommend that accurate statistics be obtained on above points. 21. Yes; I think it would, and be very valuable, and would repay their publication. 22. No answer.

D. G. McBEAN,
Cheese Manufacturer, Lancaster, Glengary, Ont.

(Translation.) ST. ISIDORE, Co. LAPRAIRIE, 29th February, 1884.

DEAR SIR,—I was gratified to learn of the appointment of a Committee for the purpose of promoting the advancement of agriculture and to enquire as to the importance and expediency of establishing a Bureau of Agricultural Statistics, such as that existing at Washington and in other countries. The idea is an excellent one, that of assisting agriculture, which has been so despised, ignored and neglected. I

congratulate you, for you have undertaken the healing of one of the most inveterate evils of our country:—routine; yes, routine has done us a vast amount of harm and we must strive to shake it off. The appointment of your Committee is a step in the right direction.

I am unfortunate in not having received your questions sooner. They cover too vast a field and are of too much importance to be answered lightly and hastily, and I shall take the liberty of answering, first, those which appear to me to be more easily solved. In this way I can prepare myself for the others and accomplish my task with less difficulty.

I returned home only on Thursday and went to work at once energetically. I soon found the undertaking to be a serious one, however, and you need not expect me to tell you anything very new; for I have no time to consult friends or books which would, no doubt, be of great assistance to me in many ways.

After this preamble, I must ask you to excuse the form of my reply, and to look upon me as one who is most anxious to convince your Committee that it is highly important and expedient to establish a Board of Agricultural Statistics, and that it is high time to place the most important of all subjects for our country at the top of the list of subjects for study, and under the high patronage of the General Government.

Your, &c.,

N. PREVOST, M.D.

P.S.—I shall send you my answers as I shall have finished them, and give the numbers at head of each answer.

1. The deficiencies of our system of agriculture are many, and are visible in every branch of culture and on every farm. The chief difficulties arise from the fact that our farmers are left to their own light and resources. Private individuals must make all experiments, run all risks, take the lead and often work at a loss for want of experience and direction. Having no scientific knowledge, they have to struggle on in the dark; they sow without discernment in soil which may or may not be suitable for the seed committed to it. The result, in many cases, is a failure of the crop, loss and discouragement. How much money is lost in this way by the wealthy inhabitants of our cities, who attempt amateur farming and play the part of skilled agriculturists. They maintain that farming is an easy matter and the theory easily acquired, but if they attempt anything new in order to avoid routine methods, they become the victims of their own want of system. Ignorant of the producing power of their land and of what each germ needs in order that it may receive fecundity and nourishment, and reach maturity, they cannot supply the needs of the soil by fertilizers, or provide a remedy by a change of crop. Let us but have method and intelligence in our system of cultivation, and any soil whatever will return us a hundred fold. "The soil is less in fault than anything," says Lafontaine; "work it well, take pains, and you will find a treasure in it." In other countries the outlay for experiments, tests and new systems, is defrayed by the State. The fullest light is thrown upon the whole matter. Each farmer knows what his land is capable of growing in greatest abundance, and it very rarely happens that the farmer loses everything, even to the seed he has sown, as we often see in Canada. He cultivates products which he knows to be suited to the character of his land; he knows the deficiencies of the soil and the properties of fertilizers and can apply the latter where they are needed. Thus he seldom labors at a loss, and he is in a better position to bear up under a fall in prices. Moreover, being thoroughly informed as to the demand and as to prices, he is enabled to take advantage of all circumstances; he takes his measures beforehand, applies his energies to those branches which will probably pay best, and it is very seldom he fails to succeed in at least several of the products of his work. He enjoys many advantages over our Canadian farmer; his products are necessarily pure, of first

quality and presented to the consumer in the most attractive form. Everything is done by him with skill and knowledge, everywhere, and at all times. I remember that our apples were at one time highly thought of on the London market, but complaint was made that they were badly packed, and quite unpresentable. What is our stunted wheat, mixed with wild seeds, worth, as compared with the pure, plump grain grown in a suitable soil? It is admitted that we lose on nearly everything we sell. What profit do we make on pork, butter, beef, eggs or poultry? We sell them because we must have money. We grow wheat enough for the needs of the household and no more. We can derive profit from some two or three articles only, and if the crops of these products fail, we are forced to borrow money. This very often happens. Were our farmers better instructed in their art, if they grew a greater variety of crops, they would be in a safer position and their farms would not be exhausted by successive cropping. They would find the means, either by rotation or by the use of natural or artificial manures, of restoring to the soil what each crop must take from it. The material for the future crop must always be at hand and ready for the wants of nature. 2. This is the question I am most loath to answer, because I cannot avoid mention of certain details of very great importance. An examination of the subjects involved in this question is of the highest interest for your Committee and would convince you of the necessity of establishing a Board of Agriculture. Before beginning, I may say that I learn from my paper, *The Rural New Yorker*, that Congress has adopted, by a majority of 155 to 127, a Bill creating the "Bureau of Animal Industry," a sub-division of the Bureau of Agriculture, with a staff of twenty employés. In a subsequent answer I shall speak of the necessity of a like Bureau for Canada. The cultivation of cereals is seldom perfect in our older parishes. The same grain is sown too long in the same places. A change of field is made only when the soil will no longer produce. The seed grain is not clean enough and not renewed often enough. Crops are not sufficiently varied. The same cereals are always sown, to the exclusion of others which would pay better and yield better and not exhaust the soil so much. A different kind of grain should be sown every year, especially in our older lands. This rotation would be better suited to the state of our soil. Beans, Indian corn, rye, Lucern, buckwheat, flax, &c., are almost unknown crops in this district. Other varieties of wheat and oats should be substituted for our red wheat and common oats. White Russian wheat and oats would bring about an improvement. Barley and peas might also be varied with advantage. Weeds are also a great yearly drain on our crops. I shall not enumerate them: the list would be too long. The great remedy is repeated summer ploughing. This is done in France and in Belgium, and must soon be adopted by us. I know farms which are poisoned by weeds. The cultivation of vegetables and roots is also a good means. A stringent law is needed, compelling farmers to keep their land clear of this pest. Some persons go to excess as regards trenches; they should be dammed up in time of drought in order to preserve the summer rains. No sooner does a shower fall than these small drains hurry off the water to the ditches and the soil retains but a very slight layer of moisture. This is a great misfortune. In spring and fall and for all low lands these small drains are of great service. But when the soil has its natural drainage they are not needed. Fruit trees are not sufficiently selected: we cultivate too many of the wild species of the country, and the fruit has no value whatever on the market. We are entirely uninstructed in the matter. Except in the hands of city amateurs or gardeners, we have very few good orchards or fruit gardens. For our people, an apple tree is an apple tree, no matter what quality of fruit it yields, and they look for nothing more. The same is the case as regards plum trees. This is really deplorable, for these trees take the place of others which are highly profitable and valuable. 3. The importation of seed from other countries would be of great benefit to our farmers. Generally speaking, the

introduction of new seed increases production. Grain which does well in foreign countries, with climates about the same as ours, will succeed well here, and would probably be a great improvement. Our successive crops of the same grain have exhausted the soil, and the number of crops included in our rotation is so small, that the same product recurs too often. We must introduce new branches of culture, or procure grain of a more vigorous type and less liable to fail. As an instance: I myself introduced white Russian wheat with white Russian oats in St. Isidore. The benefit has been immense, and at present both are widely diffused throughout several of the adjoining counties, and I have had applications even from the County of Shefford. In 1880 I was offered $3 a bushel for every bushel of wheat and oats I had to sell. These two kinds of grain are not liable to rust like the red wheat, and from the high prices asked and the prizes offered, they have always given a good crop.(?) Judging from the many new varieties of each kind of seed, I am inclined to think that the introduction of new seeds is a good thing, and that the seed merchants find therein a means of attracting purchasers and of making a good name for themselves. The Government might very well, for the encouragement of private enterprise, distribute new kinds of seed, especially to persons who apply therefor. This would be the way to hasten the introduction of highly desirable kinds of seed. Generally speaking, seeds of this kind are very dear for several years; but if by a judicious distribution, you show the excellence of such seeds and the profit to be derived from using them, no one will complain, particularly when it becomes evident that they must be a source of profit. This would be the means of increasing our production within a few years. A great deal of good would be done, especially, by the introduction of new and improved seed for the garden, and this would cost but little. Rye should be sown in many places, and it would pay better than barley and wheat. There is no better grain for general consumption on the farm. Our barley is capable of being greatly improved. Black oats, Fyfe wheat and Lucerne are not grown in sufficient quantity, particularly in my district. 5. Some ten years ago, the agent of a certain nurseryman came amongst us and, taking advantage of our ignorance, flooded us with worthless apple trees. Some individuals bought as many as a hundreed trees, which they planted and tended; but the trees have been found to be crabs of the worst kind and of no value whatever. We are cutting them down and substituting better trees. We ought to try and find fruit of different flavors. Abundant yield and keeping quality are the first things to be considered. It is better to keep to our native fruit when equally good in every other respect. I regret the scarcity of gooseberry plants; they yield abundantly, mature well and give a delicious fruit. We should give up growing pears; our climate is too severe. Some trials might be made of the hardiest and earliest varieties. A mere glance at our orchards shows that our treatment of fruit-trees is quite elementary. Every tree you meet is a proof of our apathy and of our ignorance in this branch of culture. And yet a more liberal use of fruit would largely exempt us from having recourse to medecine. The cultivation of roots is too little practiced. This is much needed for the improvement of our land and the destruction of weeds. The kinds chiefly grown are beet-root, potatoes, carrots and onions. In the parish of St. Philomène, county of Chateauguay, there is a little valley which produces onions in perfection; it is a pity they are not grown on a larger scale and more generally. Tobacco grows well in the Province of Quebec, particularly in the southern districts; one person told me he could raise 800 pounds to the arpent. We grow it in large quantities but of poor quality, and the latter fact is due rather to our inexperience than to the climate. We should make choice of the early kinds. Those which have been acclimated give a good leaf which dries well and makes a tobacco which for aroma and flavour is difficult to equal. After trying several kinds myself, I decided in favour of Canadian tobacco. I am now acclimating a

variety from the island of Cuba. The leaves are very tender and easily torn by the wind. I succeeded in growing a few heads last year. The leaf ripens rather late, and some artificial heat is required in order to dry it in good shape. The grasses we grow are timothy and clover. They are good kinds but we ought to have others, especially for pastures. Some kinds do well on high lands, and others on low lands &c., &c. We allow our meadows to get too old, and they then give but a poor quality of hay, fit only for coarse stock fodder. The great fault of our farmers is that they allow their cattle to feed on the meadows, sometimes in spring, and always in the fall. The animals trample the ground until it is hard, tear up the sod, and leave the root of the grass too bare for the winter frosts. There is much to be learned as to the cultivation of grasses. It is quite certain that a judicious selection of forest trees, fruit and ornamental trees and fruit-bearing shrubs from Russia or other countries, would lead to a great improvement in the general products of our orchards and gardens. The most important point is to ascertain the average temperature of the country whence they come, between the flowering time and the period of maturity of the fruit. Once that is known and the number of days required, we cannot but succeed, other things being equal. No doubt Russia must be our chief source of improvement; but there are many other kinds which would, when acclimated, become hardier and bear ealier. There is a Russian plum which would certainly produce a vast improvement in that product alone. Happily, industry and trade are coming to our help; I see by the catalogues of the nursery-men and seed merchants, that many new plants are forthcoming. But much time is needed before things become well known, appreciated and above all put in practice! An amateur who would undertake to visit those countries would be of great service to us and would assist the nursery-men. In this industry there are many things to be considered. Improvement of species lies in a variety of flavor, productiveness and keeping-property of the fruit, hardiness of the plants, &c. The mode of cultivation and the harvesting and preservation of fruit are also susceptible of improvement. As regards forest trees, my advice is that our Consular Agent should take up his quarters for a few weeks with the State forest keeper, and then give us an account of what takes place under his very eyes. We shall then have a practical treatise on the culture and preservation of forests, which will be quite as valuable as the learned essays of theoretical savants. 3. No answer 4. The adoption of an inspection brand is most important in many ways. Our climate and natural advantages are such as to entitle our cheese and butter products to a high place in foreign markets. The conditions being the same, why should we not compete with Switzerland and Norway? At present our butter and cheese are sold under the general name of American produce. The name is rather too general, and must be injurious and a cause of great loss to us. A distinctive national inspection brand will soon make us known; our products will then have a position and a name. The inspection, being a guarantee, naturally inspires confidence in purchasers, and business is done more rapidly and to better advantage. Producers also find it to their advantage, particularly those who make a choice article. These are the producers we need. When the producer finds the article he makes recognized, sought after, and above all well paid for, he increases his production and works with a greater energy, thus increasing his own profit and the trade of the country. The establishment of inspection will be followed of necessity by the establishment of butter and cheese factories, for our farmers know well that this is the only sure means of making a good article. You are well aware that manufactures are the best stimulus for our rural population. They excite emulation between neighbours, each one striving to have most milk, the best cows and the best cared for. And see the effect of this spirit upon the whole country. Let us remember that Canada now produces an enormous quantity

of these articles of food; the Census gives the figures at $6,000,000, and undoubtedly, the amount is now much greater. A meeting of cheese-men was held lately at St. Hyacinthe; a gentleman who was present at the meeting told me that the majority were in favour of Inspection and of a distinctive brand, particularly for articles exported. This would, he said, secure from 2 to 5 cents more for butter and 1 to 3 cents more for cheese. He said, moreover, that inspection brought about the production of a better quality of article, and that it is desirable, even as regards our home market. 6. A public analyst is very necessary, and I thought the Government had several of them employed. Such an officer, with competent assistants, would be of great service to the State in many ways, and under many circumstances. How can the law respecting the adulteration of food be enforced without an independent, competent person being appointed to discover and lay bare fraud? Nothing can be more easy than to put on the market and sell chemical manures, pulverized or otherwise, of a worthless character. The composition of these articles is unknown to us; the chemicals may be quite inert, or the article may possess but a minimum of the requisite fertilizing power, or be something quite different in its composition or its qualities. Moreover, by analyzing the soil, that officer would be in a position to direct us and enable us to select suitable and profitable fertilizers. He could show the advantage and necessity of certain fertilizers for certain soils and for certain crops. If I were about to plant an orchard, or any other fruit trees, or vines, or to grow a field of hops, would not an analyst render me great service if he were to say to me: "Your soil is not suitable; you are going to lose your money and your labour;" or, "Take such a fertilizer and such a product, that is what suits your land, and you will succeed?" How many mistakes and what a waste of money such an officer would prevent? These chemical manures are, you well know, entirely beyond our knowledge, as to their composition, properties and application. It would also be part of his task to inform merchants as to the requirements of the country in this matter. I, myself, have purchased, at a high price, Paris green, which proved to be a powder entirely inert. On applying it repeatedly, I succeeded in killing only one-half of the insects which were destroying my potatoes. Perhaps he will be able to tell us why, in certain sections of the country we are almost or quite unable to produce certain fruits, vegetables or cereals. An analyst can state the price or value of a piece of land for a given product; he can instruct the farmer and direct him as to the mode of working, preserving and applying our natural manures, and in this respect alone, he would be worth millions to the country. It is too bad to see our farms, which are so much in need of it, deprived of the return of the manure of which they furnish the chief part. N.B. The grasses which succeed timothy in our old meadows, are red top and others of that quality. 7. A Bureau of Agricultural Statistics cannot be complete and useful without the establishment of an experimental farm. It is very difficult to be practical in agricultural matters and teach no more than the theory. Before inducing the public to use a certain seed the Board must be sure that they are recommending something useful. The experimental farm must be conducted by men of instruction and specially devoted to and having a love for the art of agriculture. They must make many trials and comparisons of systems of culture. Chemical fertilizers and seeds must be studied. Foreign fruit trees must be planted in order to study their growth and report thereon, so that it may be ascertained whether they would be useful to the country. It is also good to make comparisons between different seeds of the same family in order to know the best. They can then be recommended with confidence. The Board should also examine the products of other countries and try on the experimental farm to apply the means of production, in order to introduce them into the country. New and improved implements should also be an object of study. By means of comparison we should find out the most use-

ful. The scope of experiment must include the study of stock and their products: animals of various races; experiments in feeding, with comparative tables showing increase of weight. The farm should have a well stocked poultry yard. The latter would do an immensity of good simply by showing the country people how to take good care of their poultry; it is a great source of profit. Bee raising will also be carried on and is calculated to form a most important subject of study. I consider an experimental farm to be the surest and most expeditious means of putting into practice all that the Board can effect for agriculture. Let us preach by example, let us put our precepts into practice ourselves. This experimental farm must necessarily be carried on by the labor of a certain number of young men; this will train up so many farmers fitted to do good to their fellow citizens and to diffuse a knowledge of skilful farming. An experimental farm is an absolute necessity. The Government might establish a number of them. Close by this place they would find a piece of land which is almost virgin soil, at Sault St. Louis, or Caughnawaga. This would be of benefit to the Indians; for by dint of seeing a good system of cultivation in operation, they would probably learn something of the art themselves. I am in favor of an experimental farm. (S.) Birds do very little harm to crops in this district. When I first came to St. Isidore very little wheat was sown, rust and the Wheat, or Hessian, fly being the ostensible cause. In my opinion exhaustion of the soil was the most efficient cause. The Colorado beetle has certainly reduced the potato crop by one-third. We can no longer raise currants, gooseberries or cabbages and only very few onions. We lost a whole crop of buckwheat in 1880, destroyed after flowering by an invasion of green lice. The same thing happened in 1881, but as the lice came a little later, the grain had filled and we had about half a crop. The wheat crop has been reduced by rust the last two years—in 1882 three-fourths, and in 1883 one-half; oats, in 1883, one-fourth; peas, in 1883, three-fourths. Smut is also doing much harm to wheat, oats and Indian corn. And yet it would be easy to diminish this evil, though very few persons know the remedy. The pastures very often are not seeded with grass, and all that grows in them is what chance or the wind scatters over them, more weeds than good grass. Our stock are generally of an inferior breed, too small and too pot-bellied. Our Canadian cow is evidently of a handsome and noble breed. We still meet with very fine samples of the race; but we have taken so little care of the stock that the breed has greatly degenerated. If we are fortunate enough to have a good milker in our flock, she is the first we sell; because we must get money. It would be much better to sell all the others and keep the only one which can pay. It is evident that we must raise cows; our soil is over exhausted, and it is the only means of restoring to our farms their primitive fertility. We ought to cross the best specimens of our native breed with the Jerseys and Herefords, especially in those districts where dairy products take the lead. Devons, Durhams and Polled Angus are more profitable for the production of beef, and will be better suited for the prairies of the North-West. Our breed of sheep are pretty good for the market, but the wool can only be sold for the manufacture of blankets. The introduction of Southdowns or Merinoes would be a great improvement and would be no diminution whatever of the value of the meat. I think it is better to have more milch cows to improve our land and for the profit resulting from the raising of stock. We should keep only sufficient sheep for the requirements of the family. Our breed of horses is every thing that it should be; it is suitable to our wants, and our horses sell well when there is a surplus. We should improve our stock of cows and increase their number, and remain as we are as to horses. We must adopt the factory system as regards dairy products. It is the way to produce a first-class article and to secure high prices and quick sales. If we had an agent at Liverpool or London to sell these articles, it would be a

benefit of all parties. The study of natural and chemical fertilizers is highly important; it is, so to speak, our plank of safety. It would take me a long time to tell you all we lose by not treating our manures properly. By properly handling our manures we can do without chemical fertilizers and improve our farms by raising stock. The study or practical knowledge of fertilizers and of their application to different crops is highly important. The mode of treating manure is a matter of great importance; the ammonia it contains should not be wasted by over heating and the other soluble salts it holds and which form its most valuable constituents should not be allowed to be washed away by the rain. We throw away our ashes and allow our hen manure to accumulate in the hencoops, and yet no chemical fertilizer can equal them for the garden, &c. I have often been moved to anger at witnessing the mistakes made by our farmers in their mode of dealing with manure, and the loss occasioned thereby. 13. The appointment of an entomologist would be very useful to us. He would instruct us in the best mode of dealing with insects injurious to vegetation and to the growth and maturing of fruit. In the use of Paris green alone there is enough to show the necessity of such an officer. Paris green is nearly always used mixed with plaster, and yet the water system is far better. The expense of the plaster is saved. Water costs nothing, diffuses the agent better and is more easily applied. Using Paris green to excess injures the plants and diminishes the yield of the crop. Let us now calculate what the country loses merely by the use of this insecticide, and it will be evident that we shall gain greatly by paying a good salary to an entomologist capable of instructing the public, through the press, and by means of his reports. I know a person who told me he had paid a dollar to a gardener for his recipe for destroying the cabbage worm. If that recipe were better known we might raise cabbages as we did before. I see that the Minister of Finance counts on having a surplus of a million; now, why not vote a few thousand dollars for this purpose, and thus increase the produce of the soil and the wealth of the country? All that we need is a little good will. 14. The raising of stock is what will render Canada a fertile country, and independent of any other nation, as regards the product of the soil. Our future prosperity depends on it, and the sooner we begin to apply ourselves and the greater the amount of intelligent care we devote to farm stock, the sooner we shall attain a fair average as regards our crops. We find that, in the older States of the Union, horned cattle are much more largely raised. The land, exhausted by continued cropping, will again recover its fertility. The members of the American Congress have shown that they are keenly alive to the necessity for such a Board, and passed a most liberal law for the protection of their cattle. We must protect our stock against bad treatment during transport, and against the contagion of the terrible diseases which decimate the cattle in certain foreign countries. England, our wealthiest and most important customer, has adopted, and is now adopting, most stringent regulations, in relation to the cattle trade. She has, long ago, put an embargo on cattle from the United States, and we had a narrow escape from being subjected to that severe measure. Woe to us should we ship a herd with the slightest trace of disease, for the English market would at once be lost to us. When we import cattle from foreign countries we must keep them longer in quarantine, and let them pass only after a strict and minute examination. Recently an outbreak of the foot and mouth disease occurred at Dering, in Maine. It was caused by some cattle discharged after quarantine, which infected the herds along the way as they proceeded to the West. We should have as few ports of entry as possible, and it would be well to have a good veterinary surgeon there to inspect the cattle as they arrive, or on their leaving quarantine to enter the country. In short, we must imitate the Americans and establish a Bureau. They are eminently practical as to the raising of stock. Their products are now to be

found on all the markets of the world, competing with those of every other country. I need not give you any further instances, but simply quote the following evidence given before the Committee of Congress on "Animal Industry": "If Congress does not pass a general law providing plenty of "money to stampout pleuro-pneumonia and other contagious diseases of live "stock, they will commit horrible destruction among our cattle, sheep and "swine, as they have been doing for half a century or so in the United "Kingdom." What has happened and is happening to our neighbours may any day happen to ourselves. "One ounce of prevention is worth a pound of cure!" 15. Generally speaking, there are not trees enough on our farms to shade the cattle. This applies to all the older parishes of the Province of Quebec. In our district we have to go 15 or 20 miles for fuel, and the timber left cannot last long. Many purchase coal at Montreal, and heating costs more than in the city. We pay $6 to $7 a cord for hardwood 3 feet in length, and there is but a small quantity for sale. We have a turf bog which is a great help to the poor, but it is not large and the bed is only from 3 to 6 feet in thickness. The cordwood we buy comes from the Eastern Townships. Montreal is our market for lumber; barbed wire is taking the place of rails for fencing, it is much cheaper than rails. We might plant a large number of trees on our farms, which are so exposed and unsheltered. Near the buildings, on the roads and in many places, the planting of fine trees would greatly help to ornament the farm, to shade and protect the cattle from the burning sun, and particularly to break the force of the wind. How often do we not see heavy, tender fields of grain lost to the extent of one-fourth or one-half from being twisted, broken or prostrated by the force of the wind? Could we not have live hedges, as they have in Europe? 16. The new trees which have succeeded to those of the primitive forest are those that grow naturally on the banks of watercourses, on the roadsides or near fences. They are left to themselves and are of slow growth and are frequently in a poor, stunted condition. The Act of the Province of Quebec, for the encouragement of the cultivation and planting of forest trees, has certainly diminished our apathy in the matter. Several persons have begun planting trees near their buildings and close to the roads. I think the appointing of a holiday for the planting of trees will do much good. Those who planted trees last spring met with very good success. The season was highly favorable, and I hope that next spring greater enthusiasm will be manifested, and that the day will be kept by a larger number of persons, and also more intelligently. 17. I do not know of any attempts at planting forest trees in this district. I have seen pieces of ground covered with second-growth timber. Second-growth trees are generally finer trees, with fewer roots, and a healthier and much more rapid growth. Several persons in this district have planted the Giguera or Neando maple, and some with fair success. I saw plants with a growth of from 4 to 6 feet since last spring. I think this maple is susceptible of easy and profitable cultivation. The greatest enemy of our little patches of timber is fire. The cattle do much harm to saplings and young trees. In the older parishes and especially in the vast prairies of our North-West, the cultivation of forest trees is of the greatest importance. It would be very wise to give a proper direction to the enthusiasm of those who are attempting to do something in this branch of culture, and to promote the establishment of nurseries. It is necessary to furnish information as to the most useful and most easily grown trees. Our forest trees are very fine and sufficient for all needs, but they are of such slow growth that it would be well to substitute foreign kinds. We can import them as shoots or cuttings. The cultivation of exotics from the seed is the best means of creating nurseries for multiplying and acclimating. For further development, *see* correspondence in *L'Etendard* of 7th May last, headed "Arbor Day." 18. Farmers will derive great benefit from the establishment of a Central Bureau of Agriculture. As a centre and source of

information, I consider that no public department would be of more service, and that the public would eagerly resort to it for that information. You cannot name a country, where agriculture is followed with the least care or attention, which does not enjoy such an organization, by whatever name that organization may be known. The staff of the Bureau should be competent men. They should love and be devoted to agriculture. It would be their duty to furnish information when asked for; to give lectures in various parts of the country, especially on subjects of general and practical utility. They should attend meetings of the grangers, agricultural societies, stock-raisers, millers, manufacturers of agricultural products, of preserved meats, of farm implements, forestry congresses, natural history societies, industrial and agricultural, Provincial, county and even foreign exhibitions. In each case a report should be made, and the report should remain for general information and reference. They should issue monthly bulletins and supplementary papers whenever called for by the importance of the subject treated. The more important reports should be condensed and given to the public. The staff can also cause meteorological notes to be kept in various parts of the country, analyse the varieties of soil in each district, with complete notes on the flora, the class of agricultural products, fruit trees and animals and their products; all these notes to be carefully compiled and classified for the information of the public Lastly, the Bureau should procure and carefully mark specimens of all products of the soil, animals and fruit trees; it should also have specimens of foreign products and an account of the mode of production, with full reports whenever the subject matter is of a nature to be profitably introduced into the country. The source of information and instruction for the staff of the Bureau would be the agricultural literature of the most progressive countries in each branch or subject of study; treatises on the arts and sciences most closely connected with the art of agriculture. In order not to weary your patience, I omit a number of other subjects, but you must see that there is no lack of work to be done by the officials. In order to have method, science and reason where routine has hitherto reigned supreme, you must have more than one man; you must have several heads if you wish to see agriculture leave the old beaten track. 19. It is evident that the benefit of the information which a body of educated men, devoted to agriculture, may gather, abroad and at home, as to the progress of agriculture and stock-raising, will be in exact proportion to its diffusion among the class interested. The press will be a good medium, but it will be insufficient. We cannot enter into details of a character too abstract, or too intricate, for the class who read newspapers. The distribution of little pamphlets or treatises would meet the case, and our country school teachers would easily circulate them among the people. Knowledge and information should not be confined to a small number of men; those who are to apply them are the persons most interested in possessing them. 20. A special Bureau of Agricultural Statistics is highly important. I would not stop half way in the road of progress. Nothing is more important than to know the actual and probable available quantity of all the products of the soil, to have the prices, sales and movement of grain, cattle and all their products; nothing more necessary than to know the fluctuations of the market and the rates of freight. It was a Board of this kind which said, last year, to the producers of the West: "Sell while freights are low and prices are good! Sell! Sell!" They did not sell, and what is the consequence? To-day freights are 20 to 45 per cent. higher, and wheat only finds buyers at a reduction of 20 per cent., a certain loss of 40 per cent. This constitutes an enormous loss; but that is not all, the wheat has overstocked all the mills of the country, and the elevators hold enormous quantities. Grain which is available in this way generally becomes an object of speculation, the producer is made

the victim of his own eagerness for gain, and the trade of the country suffers. With the facilities for transport we now have, a knowledge of the actual and probable available product is of immense value; it stimulates business and facilitates the fixing of a just and certain price; the producer hesitates less and runs less risk of loss or of asking too much. He sells always at an equitable price, and knows when and to whom he ought to sell. The Bureau is an excellent resource of information for banks, for the wholesale trade and for monied institutions. It is a guide for the existing industries of the country, and is calculated to develope new industries. In short, it is the surest and most impartial indicator of the wealth produced by the harvests of the country. 21. The publicatian of bulletins and monthly statements showing, in distinct reports, the state of agricultural production in all its departments and all its phases, is certainly advantageous. It is not an innovation; the thing is already established by our neighbors. The establishment of such a bulletin cannot cost much. It can be distributed to the press, to public institutions. to Municipal Councils, Mayors, Justices of the Peace, market clerks, &c. The bulletins should give forecasts of the crops of cereals, fruits and hay, and the state of the crops; they should give notice of the appearance of contagious diseases, with the names of the districts infected; the importation (with name of importer) of thoroughbred cattle; the discovery of improved means of promoting the productiveness of the soil; the state of the market for all produce of the soil and of stock at home and abroad, and the prices of chemical manures and of everything required by the farmer. The bulletin might also serve to publish and make widely known all new formulæ calculated to be of use to farmers, as to the mode of preparing composts or chemical combinations, of preparing fodder and feeding stock, and also give plans for new buildings needed on the farm. It would be useful to immigrants by showing the demand for workmen, farm hands, &c. The bulletin should also make mention of meteorological accidents, such as frosts, droughts, rains, &c. It should call attention to the visible supply of agricultural products and elucidate them and all changes in prices and freights. Undoubtedly these bulletins are highly important for the information and instruction of the public. They are the means of diffusing the benefits which the establishment of a Board of Agricultural Statistics is calculated to produce. 9. I have given a partial reply to this question in the 8th answer. Buckwheat failed completely in 1880, and partially in 1881 owing to the green flower lice. The army worm has not appeared in our district. Last year the *calandra granaria* did great harm, especially to the pea crop. I saw some pease each grain of which was more or less injured or eaten. In one case, having bought two bushels by weight, I found that a bag, which always holds two bushels and over, would not hold two bushels by weight, because the pease were partially destroyed. The *cecidomyia destructor* is doing great harm to the wheat.Certain kinds are more liable to injury: for instance the Froment wheat which is found to have no kernels left in many of the heads. The garden louse devours nearly all our turnips, radishes, &c., in the spring. The white butterfly grub has compelled us to abandon the growing of cabbages. Gardeners alone now grow that vegetable; they destroy the insects in the fall, and the farmers buy their cabbages from them. I think the gardeners use Paris green to kill the grubs. I have used it myself, but I do not like the practice. The caterpillars have long since destroyed all our currant bushes. Paris green is a good remedy for this disease of our currant bushes.I have long used it,every year. Very little is needed. The most difficult insect to control and the most injurious is the potatoe beetle. It reduces the yield of the crop fully one-third. Some fields are more and others less injured. Paris green is the heroic remedy. It is the only effectual one, and the cheapest. I think the preparations used generally contain too large a proportion of the poison. I put a spoonful in four gallons of water, and when the prepartion is well applied, it is effectual, and does no

harm to the plant. The liquid form is far the best. It divides the poison better, is more easily applied and more effectual; besides, the water costs nothing. Since the appearance of the potatoe bettle we find it difficult to grow tomatoes, which it also attacks. The years 1876 and 1877 were terrible years for the quantity of caterpillars; they destroyed our few remaining apple trees, and were so numerous that they attacked the little groves of timber and devoured the leaves of the maples, elms, &c. One of my friends saved his trees by applying coal oil Last year the yellow fly, or cucumber fly, destroyed our punkins, cucumbers and melons. This was general throughout the district. 10. No measures have been adopted against birds; they do little, if any harm. The only loss is by crows and plover in the fall. The latter are so keenly pursued by sportsmen that they have almost disappeared. We use Paris green, mixed with plaster, for the potato beetle. Many persons have a horror of using it, and prefer to pick off the insects, the consequence being the loss of one-half their crop. It is also used to destroy caterpillars on currant bushes and the grub on cabbage. I do not approve of using Paris green on the cabbage plant; it is too dangerous; the caterpillar is destroyed by mechanical means; it has nearly disappeared of late years. 11. In order to be in a position to inform the Committee as to the losses of the farmer from the operation of insects injurious to the various products of the soil, I need statistics of the quantities produced now, and of their value. I may state, however, that we can no longer grow cabbages, currants or onions. The potato crop is reduced one-third. Pease have been largely devoured by the *Calanda granavia*, and injured especially by rust, the past two years; and the crop of cucumbers and pumpkins was destroyed last year by the yellow fly. 12 Except in the years 1876 and 1877, I do not think the fruit trees have suffered from insects.

46 Woood Street, Toronto, 24th March, 1884.

Dear Sir,—I must apoligise for not replying to the questions contained in your circular long before this.

The fact is it reached me when I was prostrated by sickness. I have been unable to attend to matters of importance till within the past few days.

You will therefore, excuse any want of fulness or clearness that may be observable in the replies.

In the annual report of the Fruit Growers Association and Entomological Society of Ontario, there is a mass of reliable information on several of the subjects embraced by your enquiry; and if you have not access to them, I shall be happy to send you copies, as far as we now have duplicates.

Yours, &c.,
GEO. BUCKLAND.

G. A. Gigault, Esq., M. P.

1. Canadian farmers have in the older settled districts, almost, if not quite equal advantages with Americans, for competing in foreign markets. In the newer districts, good ordinary roads and railway facilities are of course greatly needed. 2. (1-2) Imperfect cultivation, inadequacy of manure, and want of rotation. (3) Insufficient attention to breeding of animals adapted to soil, climate and markets. (4) Want of attention by private dairies to the science and practice of the art. (5) Imperfect protection of the ground, mechanically and chemically, suitable varities, pruning, shelter and protection. (6) The greatest general deficiency is neglect of farm yard manure, as to quantity and quality, involving incalculable loss. 3. Yes; change of seed, occasionally, with reference to soil and climate, within certain restrictions of the latter, has always been approved in practice. But the greatest care is needed in procuring perfectly prime and sound seed. In this respect much is yet to be accomplished. 4.

There is reason to believe that a uniform and exact system of inspection of cheese and butter would be at least equally beneficial, as in other commercial products. It would tend to raise the quality of our butter, in particular, of which there is pressing need. 5. Yes; carefully conducted experiments in this direction, would lead to reliable information of much practical value. 6. The services of such an official might be made of great advantage, both to farmers and others. 7. Experimental farms and gardens in the older Provinces of the Dominion, efficiently conducted, would materially conduce to the advancement of agriculture, horticulture, forestry and ornamental planting. 8. Birds are sometimes locally injurious to crops, but the depradations of insects are often more or less destructive. 9. Much reliable information on these points may be found in the annual reports of the Fruit Growers' Association, and Entomological Society. 10. We have in Ontario a Statute for the protection of birds beneficial to agriculture, by allowing only persons holding permits to shoot them, strictly for scientific purposes. The conditions of the statute are only partially carried into practice. 11. I know of no reliable data by which this important information could be attained. The facts could only be satisfactorily ascertained by thorough statistical investigation. 12. Timber trees have locally suffered from these causes occasionally, and in some seasons and situations the mischief produced has embraced wider areas. 13. The appointment of a qualified and energetic entomologist might be made of great advantage to both farmers and gardners. In several of the States such functionaries have rendered services of the highest importance to the cultivators of the soil. 14. The most vigilant means should be taken to arrest infectious diseases among live stock, with a view of mitigating their influence and ultimately of stamping them out. A rigid quarantine and more general and efficient veterinary inspections are very much needed. 15. No; many farms in the older settled sections have not enough forest left to meet domestic wants. Both shelter and shade are too often found of very inadequate extent. 16 Hitherto, I believe, no steps of sufficient importance and extent have been taken to increase the production of timber by planting, an object of daily increasing necessity. 17. I have very little definite or reliable information on these matters, which require careful and extended observation, based on a sufficient collection of well ascertained facts, that they may have a practical value. 18 A Central Bureau for the Dominion, if adequately equipped, would become an important means of collecting and diffusing information on the various industries of the country. It could utilize information already obtained by such Provinces as devote attention to industrial statistics 19 Yes; the widest dissemination of the results thus obtained should be given, otherwise the benefits of the investigations would be very much curtailed. 20. Yes; if carefully done the results obtained would be of benefit to both producers and consumers, by enabling the public to procure information of a reliable character relative to the gross annual produce of the soil. 21. Yes; provided that the information be clearly and briefly stated and circulated, particularly among the classes of people who feel personally interested in the matter. 22. I would suggest that such a Bureau might beneficially include the collection of facts relative to the diseases and treatment of live stock, especially such as may be of a contagious character.

GEO. BUCKLAND,
Assistant Commissioner of Agricu ture, Toronto, Ontario.

BELLEVILLE, 13th March, 1884.

SIR,—Herewith I have the honor to hand you a copy of the answers to the Committee's queries, sent to West Riding of Hastings, agreed to at an informal meeting, held as therein related.

I have the honor to be, Sir, your obedient servant,

JAMES T. BELL,
Prof. of Mines & Agriculture, Albert College, and Secretary of said meeting.

G. A. GIGAULT, Esq., M.P.,
Chairman of Committee of Commons on Agricultural Statistics.

The following gentlemen, having received circulars from your Committee of the House of Commons on a proposed Bureau of Agricultural Statistics, requesting information on certain subjects submitted to them in the form of questions, met by consent at the County Clerk's office, to consult upon the matters contained in said circulars, viz: Judge E. B. Fraleck, Prof. J. T. Bell, Dr. E. H. Coleman, S. T. Wilmot, A. McClatchie, Jas. Bird, Hy. Fenn, J. H. Peck. T. Wills, County Treasurer, was invited to take part in the discussion.

On motion, Judge Fraleck was called to the Chair, and Prof. Bell was requested to act as Secretary.

After consultation the following answers to the questions propounded were agreed upon:—

1. Distance from markets. High rates of transit on agricultural produce. Scarcity of labour. Out-door—Encourage the immigration of agricultural laborers, aiding those only who have been trained on the farm. In-door—To offer increased inducements and facilities for the immigration of trained female domestics, from Great Britain and Germany; and we would recommend the Government to establish one or more "homes" in each Province, to receive such female domestics, until provided with situations. 2. Want of proper drainage; especially sub-soil drainage. Want of care in preparing and applying barn-yard manure. Absence of artificial manures. Neglect to extirpate weeds. Root-growing is discouraged by the scarcety and high price of labor. The breeds of sheep and cattle should be improved by the importation of high class animals. A systematic and uniform mode of butter-making is the great want. The cultivation of such fruits as are most suitable for exportation ought to be encouraged. 3. The importation of foreign seeds, under proper regulation and inspection, would be beneficial. 4. A thorough system of inspection and brarding would be likely to enhance the reputation of our butter, and maintain that of our cheese. 5. Yes. 6. The Government should appoint a Public Analyst in every city in the Dominion, who might take cognizance of food substances, groceries, drugs and water, in addition to soils and manures 7. Yes; there should be one such in each Province. 8 and 9. Peas have been injured by the weevil (Bruchus pisi), wheat by the midge, barly by wire-worm and grub, apples by the codling moth (extensively), plums by curculio (Conotrachelus nenuphar), potatoes by the Colerado beetle (Chrysomela decemlineata). 10. No general measures have been adopted to destroy or limit injurious birds or insects, though some attempts in that direction have been made by private individuals. 11. We have no data on which to found any definite information. 12. Not to any appreciable extent 13. Yes; provided the Entomologist met the farmers to give personal explanations. 14. Yes. 15. Timber is begining to be scarce in this riding. 16. Not to any extent. 17. A few attempts have been made by individuals, but too recently to give results. 18. Yes. 19. Yes. 20. Yes; if care be taken to obtain correct and reliable information. 21. We think this could be more advantageously done through the

local newspapers. 22. We think that the suggestions and recommendations asked for in this question had better be made individually and independently.

(Signed) E. H. COLEMAN.
" A. McCLATCHIE.
" JAMES BIRD.
" HENRY FENN.
" JAMES H. PECK.
" THOS. WILLS.
" SAML. T. WILMOT.
" E. B. FRALECK, *Chairman.*
JAMES T. BELL, *Secretary.*

SHIRE HALL, BELLEVILLE, 10th March, 1884.

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1. Difficulty in procuring a sufficient amount of help both in the field and in the house; cost of transport of his produce. 2. (1-2.) General insufficient supply of manure, and prevalence of weeds from neglected fence corners and road sides. (4.) Bad quality of much of our butter; no systematic mode of manufacture. (6.) The fertilizer in general use is barn-yard manure, much of which loses most of its efficacy from being allowed to lie for months in the open, exposed to the action of the sun and rain, which alternately vaporize the volatile and leach out the soluble parts, until only the *caput mortuum* of the dunghill remains. There is also a deficient supply of artificial manures. 3. That would depend largely upon the conditions of climate, soil, &c., under which such seed might be grown and ripened. No doubt there is generally considerable advantage in the interchange of seed; but it must be managed judiciously. Some of the most approved varieties of European grains have been found not to succeed in this country. 4. Such a system would certainly tend to the improvement both of the quality and reputation of our butter, in both of which points improvement is much needed. Our cheese scarcely needs such a system applied to it, its reputation being already firmly established. It might, however, tend to maintain the high quality and certify the identity of our produce. 5. The experiment might be worth trying. 6. Such functionaries are very much needed in Canada a public analyst should be located in each city in the Dominion, who might be charged with the analysis of water, foods, drugs, &c., in addition to soils and fertilizers. 7. Certainly; one in each Province. 8. No material deficiency from these causes, only partial and local. 9. Apples from the codling moths, plums from the curculio, peas from the weevil, wheat from the midge. 10. No general effort has been made, or indeed needed here. A few individuals have adopted protective means to a small extent. 11. No. 12. Not to any material extent. 13. I think it would, provided said officer took the information home to the farmers, by holding meetings in connection with the farmers' clubs and local agricultural societies, as well as by the distribution of tracts on the subjects, and especially I would recommend that tables, containing authentic figures of the beneficial and injurious insects, be placed in the public schools of the several Provinces. 14. I think such extension desirable. 15. This district is fairly well wooded as yet, but the area of forest is being diminished year by year, in some sections seriously so. 16. None that I am aware of, except the planting of shade trees in the city and of ornamental trees by a few suburban residents. 17. I know of none. 18. I think such a Bureau would be of immense benefit both to our farmers and merchants here, and to our reputation and standing as an enlightened community abroad; and would prove an attraction to the better class of emigrants. 19. Yes. 20. I should recommend the formation of such a section, and I think the regular periodical publication of such statistics, especially those which relate to the movements and prices of grain,

cattle, &c., rates of transportation, fluctuation of foreign markets, &c., would enable our farmers to deal more understandingly with the merchants and middlemen who intervene between them and the consumers. 21. I think the most advantageous mode of publication would be through the columns of the local newspapers, especially the weeklies, which come into the hands of most of our farmers. 22. I think the Bureau might offer prizes for the best essays on the cultivation of individual field, orchard and garden crops, on the improvement and ornamentation of the homestead, the management of shade trees, shelter-belts and plantation of forest trees, and for planting successfully the largest area of such trees, &c., &c.

JAMES T. BELL,
Professor of Mines and Agriculture in Albert College, Belleville.

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1. Not answered. 2. In the cultivation of apples, in the more favored districts of our Dominion, much loss is occasioned in years of plenty from the abundance of autumn-ripening fruits, the markets being glutted. The majority of orchards hitherto planted have contained too large a proportion of such fruits. Farmers need to have this impressed on them; the difficulty may be remedied by top grafting with winter apples. In the colder sections there is great need of hardier varities of all sorts which will better withstand the severities of the climate. This might be accomplished either by the introduction of hardy varieties from other cold countries or the production here of new varities by judicious cross fertilization and selection. Many of the special fertilizers now sold are frauds, and there are but few where the farmer who purchases them gets value for his money. 3. The judicious importation of suitable seed from foreign countries, having climates similar to our own, would doubtless be a benefit to our farmers. All plants grown as crops for a number of years in succession in the same district, tend to run out more or less, and in such cases new seed from distant localities will usually add vigor to the crop and increase its productiveness. 4. I believe it would. 5. I believe such importations would be a great benefit to all the colder sections in our Dominion, and would, in a short time, result in a great extension of fruit culture in districts where now no home-grown fruit is to be had. 6. I am strongly of opinion that it would, and if faithful examinations and reports on such fertilizers made, and parties defrauding the public promtly prosecuted, the farmers would be greatly benefitted thereby. 7. Such experimental farms or stations should be established in every Province in the Dominion, but the Dominion Government itself should have some central establishment, as at Washington, in the United States, where young trees and plants might be grown and sent by mail to be tested in all parts of the Dominion. Such an establishment should be managed by a Council or Board of Managers, apart from politics, and have a revenue to support it derived from a donation of public lands for this purpose, as in most of the United States. 8. The yearly losses to farmers from the depredations of insects are enormous; a considerable proportion of this loss is preventable by the adoption of suitable remedies. As an example, two years ago about 20 to 25 per cent. of the wheat crop in this section of Ontario was destroyed by the Hessian fly. The best methods of subduing the insect was made known through the press and the measures adopted have been largely successful in subduing this enemy. 9. It would be impossible to answer this question in brief. As a partial reply, I mail you with this a volume I have written on the insects injurious to fruits. A similar volume might be written on those injuring grain and other field crops, and another volume on those which injure forest trees. 10. In this Province much good has been done by the dissemination of practical information as to the best remedies to adopt for destroying injurious insects, a work

which has been done mainly through the agency of the Entomological Society of Ontario. Farmers and fruitgrowers once being aware of the proper course to take are not slow to follow it. 11. Many birds are destructive to fruits, notably the cherry birds and robin. The English sparrow is destructive to both fruits and grain. Neither of these birds should be protected. With reference to insects, see reply to question 9. 12. The forest trees in every district suffer much from injurious insects, particularly from the work of the different species of wood and bark borers. 13. There is no doubt that the appointment of a compentent entomologist who could, during the season, visit the localities where injurious insects were doing most damage and give information to the sufferers and otherwise disseminate information generally on the subject, would effect a great saving to agriculturists generally. 14. No answer. 15. The supply is rapidly giving out. Trees have been and are being extensively planted for shade and ornament, but not to any extent for fuel. 16. Very little has been done. 17. I know of several small clumps of black walnut which have been planted with this view, and are doing very well. The results of street planting everywhere proves that our hard and soft maples would succeed well if planted for forest purposes. Small clumps and single trees of European larch have grown very rapidly—a very useful tree for railway ties. 18. I believe it would, if efficiently managed. 19. Yes. 20. I would, as I think that the dissemination of such information would enable may farmers to select the best time for the disposal of their crops and thus realize higher prices on an average of years. 21. I am of opinion that they would be worth many times their cost to the country. 22. No answer.

WILLIAM SAUNDERS, F.R.S.C.,
President Entomological Society of Ontario;
President Fruit Growers Association of Ontario;
Public Analyst for Western Ontario, London.

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1. Want of intelligent knowledge of the business. Sound agricultural education is as much needed by the farmer as professional education by the professional man. 2. As to fruit, the want of intelligent knowledge of the business. 3 and 4. No answer. 5. Ontario has imported trees and scions from Russia by advice of the Fruit Growers' Association, for cultivation and trial at the farm of the Agricultural College, and dissemination from thence to the colder parts of the Province. Such introductions often give us most valuable fruits. 6. The analysis of commercial fertilizers, to be followed by the confiscation of all not equal in value to the price at which they are sold, would be a benefit. The analysis of samples of soil is of no practical benefit to the farmer. (See Canadian Horticulturist, Vol. VI, page 277.) 7. Most certainly. I believe Canada is the only British Colony that has no Botanical Garden, and it—this fact—is a standing disgrace to our civilization. 8. The fruit crops by insects. 9. The apple suffers most from the codling moth; the plum from the curculio. 10. Isolated cases only of cultivators catching and killing the curculio—no combined efforts. 11. I cannot give details, but estimate that in some seasons fully one-half of the apple crop is rendered unmarketable by the codling moth, and in some seasons the plum crop wholly destroyed by the curculio. 12. Not to my knowledge. 13. The Entomological Society of Ontario is now giving through its annual reports full information to cultivators in Ontario on the subject of insects injurious and beneficial. 14. No answer. 15. There is not. There should be not less than ten acres of woodland in every hundred. 16. Not to my knowledge. The Ontario Tree Planting Act is intended to encourage such tree planting. 17. None that have come to my knowledge. 18. I believe it would 19. I believe such dissemination of information very desirable. 20. I would. The intelligent fruit cultivator would be able to ascertain

what fruits were in demand and where; whether there was likely to be a deficiency of any particular fruit or a surplus; whether to sell at home or ship abroad, &c. 21. On this point I am not prepared to speak positively, but am inclined to believe that it would be sufficient to issue such bulletins monthly, from July to November. 22. No answer.

D. W. BEADLE.
Nurseryman, St. Catharines, Lincoln, Ont.

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1. Speaking from a New Brunswick point of view: want of capital and experience. The surplus produce of New Brunswick has not been greatly in excess of the home demand, and as a consequence farmers have not seen the necessity of producing a better quality of produce, and when it is sent abroad it is not as neatly put up, and therefore appears at a disadvantage. This is very perceptible in the article of butter. 2. No answer. 3. Yes; if pure. 4. Yes; to a great extent. 5. Yes; on this point I obtained the opinion of a nurseryman which was favorable. 6. Yes; but one for the Dominion would be of little use. If schools for agriculture were established in the various Provinces, or, say, one in Ontario, one in Quebec and one for the Maritime Provinces, an analyst might be provided for in each, by a subsidy from the Central Government. Samples taken only from the users. 7. As the climate, soil, &c., of the different Provinces of the Dominion vary, the establishment of provincial agricultural schools and experimental farms should be encouraged by the Central Government, where such experiments could be carried on with better results. Ontario already has one and other Provinces will follow, the Maritime Provinces probably uniting. 8. From birds, none; from insects but few, chiefly the weevil, potatoe bug, cabbage moth, turnip fly. 9. Potatoes and plums. 10. Birds, none; insects and bugs: Paris green, salt and lime; nothing to any great extent. 11. No; wheat at one time had to be given up entirely; of late it has been grown with partial success. With moderate care all the above named articles can be grown successfully, grapes excepted, and plums partially so. 12. I think not. Spruce was attacked, but of late have heard very little about it. Orchards where neglected sometimes suffer. 13. For the Dominion as a whole, yes; much needed. 14. It is very desirable, although this Province at present is particularly free from infectious diseases; such inspectors might be attached to schools and there be made useful. 15. Plenty, although the tendency is to clear too closely. 16. None that I have heard of. 17. Have heard of none. 18. It certainly would, though with the establishment of provincial agricultural schools the staff need not be large. 19. Yes; this is a long felt want and has frequently been discussed by the Farmers' Association of New Brunswick. 20. This would entail a heavy expenditure of money and the information would not be received quickly enough, as a general rule. It would be better to furnish reports of movements of grain, &c., to reliable papers, fortnightly or monthly, for publication. 21 This would be unnecessary if the above suggestion were acted upon, otherwise it would be of sufficient advantage. 22. Yes; under its auspices a Dominion Agricultural Association might be formed, composed of delegates from the several provincial associations, which in turn would be composed of delegates from the county or other societies, thus making a complete connection or channel through which much valuable information could be received or disseminated, and through which reliable statistics could be obtained.

Respectfully submitted,

EDWIN. B. BEER,
President New Brunswick Farmers Association, Sussex, Kent County, N.B.

OTNABOG, N.B., 9th March, 1884.

DEAR SIR,—I have endeavored to answer the questions proposed in your circular in a practical way, and as briefly as I possible could (as I presumed you so require them). I am very much pleased that Parliament has taken hold of this matter in earnest, and wish you success in your labours. I am only to glad to contribute, in a small way, what my views are on the several questions propounded in your circular.

I am, &c., yours very truly,

S. L. PETERS.

G. A. GIGAULT, Esq.,
Chairman of Committee on Agricultural Interests,
House of Commons, Ottawa.

1. The want of a more thorough knowledge of the kind of crops best suited to the various soils and the most economical method of making them more productive. The scarcity of cheap labor is largely felt also. 2. (1) Possibly a want of more thorough cultivation of the land. (2) None. (3) Farmers not sufficiently careful in securing good breeding animals. (4) In the production of butter the great want appears to me to be, the reluctance on the part of our farmers and dairymen to supply themselves with the most approved implements with which they can convert their milk into butter. By far the larger portion of them seem willing to stick to the shallow-pan system of their fathers. This might answer a portion of the year, but is ruinous for the other part of the season. With the deep can, or creamer as it is called, in use in our dairies, the first step towards making a good article of butter is secured. With these cans submerged in cold spring or ice water, there is no difficulty in securing all the cream from the milk in twelve hours, either in dog days or any other time. With a good article of cream there should be no difficulty in producing a first-class article of butter which will command the highest price. The cheese of the Dominion will command a good price in any market. (5) Proper cultivation and pruning. (6) Barn-yard manure, superphosphate. 3. A change of seed is always desirable every second or third year. If made from a country whose climate is similar to ours, would consider it beneficial. 4. It possibly might in a foreign market, from the fact that it would prevent, to a large extent, the shipping of any but a first-class article to such a market, thus making the quality uniform. A system of inspection for the home market would be attended with many drawbacks and annoyances to first-class dairymen. Inspection, too, would be somewhat costly. In my opinion it would be better to aid by a bonus the establishment of creameries and butter factories, where the article made is sure to be of a good quality. The dairy interest is among the first, in the products of the Dominion, and anything Parliament can do to raise the standard of its production would be directly in the interests of all classes. 5. Our nurserymen and fruit growers have already a large list of fruits from which to make selections; still it might be desirable to import scions and plants from other countries of a high standard. The more important thing just now is, I think, to impress our farmers with the idea that if they wish to have good fruit they must cultivate and enrich their orchards and keep trees properly pruned. 6. Most certainly. We, in New Brunswick, feel the loss occasioned in not having such a person employed by the Government, with whom the farmers might feel free to consult. The residence of the public analyst should be at or within easy distance of the Experimental Farm, if one was established. 7. I look upon the establishment of an experimental farm in New Brunswick as a most desirable thing. The science of agriculture is as yet but poorly understood by the great mass of farmers. A well conducted experimental farm would be an assistance in helping to discover the hidden things in connection with agriculture. 8. The Colorado beetle has proven very destructive to

potatoes. The grain-aphis did a great deal of injury to the oat crop in 1882; the yield in many cases did not exceed twenty bushels to the acre, and of light weight. The squash bug (*coreis fristis*) proves very destructive to all varieties of the squash, cucumber, &c. The army worm (*lencania unipuncta*) proved very destructive to the hay crop, on alluvial lands, in the valley of St. John, in 1882, many farmers losing almost their entire crop. 9. Fruits—The apple suffers most from the apple tree borer and codling worm. The pear, cherry and plum from the slug (*selandria cerasi*), which preys upon the leaves, destroying them, and thus prevents the fruit maturing. The plum suffers largely from the *curculio*. Small fruits, such as the gooseberry and currant, suffer from the depredations of the currant worm, to a large extent. Birds do little damage to crops. 10. Farmers use Paris green to destroy the Colorado beetle. Hand-picking has proven the only sure remedy against the squash bug. The army worm pest is without a remedy this far. Hellebore has proved of service in the destruction of the currant worm. 11. Cannot form any estimate. 12. Not to any extent. 13. It is reasonable to suppose it would. 14. Fortunately our section of country is comparatively free from infectious diseases among stock. No doubt, however, that such inspection at stated periods would be of great advantage in guarding against disease. 15. Ample. 16. None. 17. I know of none 18. Yes. (Emphasized). 19. The information gained by the Central Bureau would be of little benefit if it was not disseminated by handbooks and reports placed in the hands of the farmers. 20. Most certainly; it is just what the Dominion has needed for years. 2nd. A correct knowledge of the market value of his farm products; and the probabilities of an advance or declension in values. 21. Yes; but semi-monthly would be still better. 22. I am of the opinion that such Central Bureaux should not only be informed of the acreage under the different crops, but should also be informed of the average yield per acre, so that the whole productions of the Dominion might be fairly known, or estimated.

S. L. PETERS,
Farmer 'Otnabog, Queen's County, New Brunswick.

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1. Agriculture in New Brunswick, at present, does not suffer from any peculiar difficulties, unless a rather low condition of farming. A fair proportion of the better farmers have adopted an advanced system and use suitable implements; the larger portion do not; the quantity raised is therefore very small. 2nd. The heavy duty on shipments to the United States, this being almost our only export of agricultural produce. (1) The land is not properly prepared, as a rule. (2) Same objection. (3) The proportion of improved animals is too small. (4) Dairies very small; imperfect arrangements. 5. Cultivation of fruit is becoming very general in New Brunswick; great loss was sustained by unsuitable trees from United States nurseries; home grown and grafted trees are more successful. (6) Barn-yard manure; mussel-mud along the shores of the Bay of Fundy and Gulf of St. Lawrence in large quantity; very superior for cereals and grasses. Fish, pumice, superphosphates, plaster, &c. 3. Very much, provided care was taken in the proper selection of kinds and from suitable countries. Some years ago, by direction of Government, I imported wheat from western Ontario with great advantage. 4. I think it would do much good. The fact that the butter from any of our good farms being branded only second or third rate, would induce more care, both for the better price and reputation. Free traders object, as an interference with trade. No force in this, while it improves the quality and price. 5. The introduction of suitable trees and scions would be very valuable, but each kind should be tried by suitable persons before many are sent through the country; the loss of the trees is as nothing compared with filling the country with poor fruit that people don't like to

cut down and are not worth the space and labour of continuing to care for them. 6. No doubt but good results would follow the labour of a practicable man, but much money is thrown away in paying a man that throws difficulties in the way, when his salary is safe; if he is paid by fees none patronize him. This Province paid such a person for years; very little good. 7. I have no hesitation in recommending such a farm, and think it would be most beneficial. I have recommended that something of this kind should be added to our Government stock farm. This course is recommended from want of means to sustain a separate farm. 8. We have never suffered in New Brunswick to any great extent from the depredations of eitheir birds or insects. Black birds take a little corn, and on several occasions a portion of the Province suffered from caterpillars and different kinds of worms, but never general. I omit the Colorado potato bug, which has been general, but no great loss from it. 9. Except, as stated above, birds have not injured our crops. In addition to caterpillars, grain was injured two or three years in some sections by the midge, and wheat by the weevil (improperly named); apples by the caterpillar, tent worm, &c.; plumbs by the borer, and small fruits by the currant worm, &c. 10. There have been none; each sufferer adopts such means as he thinks, when his crops were suffering, but nothing of a combined or general system has been adopted or found necessary. Great fears were entertained a few years ago that the potato crop would be destroyed, but those fears have not been realized, and the crop has suffered but little. Paris green, London purple, &c., is effective. 11. From the statements given in paragraphs 8, 9 and 10 the Committee will learn that a more particular reply to this cannot well be given. No doubt a certain loss is sustained every year, but no means have been taken to ascertain the value, as it has seldom been serious. 12. A few years since it was observed that the tamarac, known also as juniper hackmatac and larch, were dying; then the fir and spruce were observed to suffer. It extended year by year—it was said a small worm was the cause; this has been questioned, and the real cause is in doubt. The loss is very great. 13. I do not think that such an appointment is required in this Province at present. The duty might be done by some of the present officials, if required. 14. We have not participated in the quarantine regulations at all. I think St. John and Halifax were named stations, but no provision for caring for stock in quarantine has been made. This has been demanded on several occasions. 15. O, yes; any quantity; it is cleared land we want; 95 per cent. of the Province is shade, fuel, &c. I think I am correct in saying not over 5 per cent. is cleared. 16. No; we want the wood cut and the land cleared. At the same time it is acknowledged that more care of the standing timber should be taken, and in many instances it would be good policy to plant maples, larch and some other varieties. 17. Nothing of this kind has ever been done and not probable will be done or required during our time. Reasonable protection is advisable. 18. Yes; this is much wanted. The Local Government has not felt that they could furnish the means for this work, while the need of it has been acknowledged frequently. If no other arrangement is made it could be added to the the Provincial Department of Agriculture. 19. Yes; this is much wanted. I have application very often from the Dominion officer for emigration for such information; at this time I have a long complaint from him that he cannot obtain this very information. 20. I would. I have done so to the Local Government; the great need of this information is acknowledged at all times, but never so much as at present. The present grant for agriculture is as large as our Legislature cares to make it, and it is all absorbed before this service is reached. 21. I think they would; if not at once, they would very soon; it is surprising how much settlers from the old country want such returns. It would do good. 22. I can only repeat my opinion of the benefit to arise from a correct return each year, as early as the information can be obtained of the crop harvested, and two or three

bulletins issued during the season, giving estimates of the breadth of land under each crop, and yield per acre.

(The above answers are given from a New Brunswick stand point, as I do not assume to speak from any other.)

JULIUS L. INCHES
Secretary, Board of Agriculture, Fredericton, New Brunswick.

1st. The want of better distribution of thoroughbred stock. 2nd. The circuitous route of transportation and the absence of agricultural reciprocity with the United States. 2. (2) The lack of variety in grasses. (3.) The want of stock for dairying purposes, and finer grades of wool. (4.) Carelessness and want of knowledge. (5.) Neglect of interculture, and lack of horticultural interest, there being comparatively few orchards in the Province. 3. I should say it would. We find the cereals, particularly wheat and barley from the other Provinces, better for seed than the growth of the Island. 4. Nothing could be better; besides enhancing the value of these articles it would act as a stimulus, putting new life and vigor into the whole dairying branch of industry. 5. Should think that experiment would be advisable. 6. I think it would be a great advantage, as it would greatly aid the farmer in the application of fertilizers. 7. It would be most advisable in our agricultural interests. 8 Considerable. 9. Wheat from the midge or weevil and cabbage from the green worm. 10. None. 11. Should say about $1,000. 12. No. 13. Undoubtedly. 14. Most desirable. 15. Yes. 16. None. 17. No answer. 18. The establishment of a Central Bureau for the purpose enunciated would be of incalculable value to the Dominion agriculturist, forming, as it were, the head of the farming industry, through which useful and reliable information could be obtained on all important questions appertaining to the general welfare of the agricultural industry. 19. Most certainly. 20. Such information would be of great benefit, as it would enable the farmer to dispose of his surplus stock and produce to the best advantage, and also as a guide to production. 21. Yes. 22. No answer.

PETER J. D. EDMOND,
Farmer, Sommerville, County of King's, P. E. I.

March 19th, 1884.

PORT WILLIAMS, N.S., March 17, 1884.

SIR,—With pleasure I enclose your list of questions, which I have answered to the best of my knowledge and belief, and trust they may be of some assistance to you in promoting the laudable object you have in hand.

I am glad to know there are members in the present House who are willing and able to advocate the cause of agriculture, which has too long been allowed to take care of itself; and I sincerely hope you may be successful in inaugurating a new era in the agricultural prosperity of our great Dominion.

With best wishes for your success, I am, Sir, yours very truly,

C. R. H. STARR.

To G. A. GIGAULT, Esq., M.P.,
Chairman Committee on Agricultural Industries.

Translation.

1. The force of habit among a great number, and the want of instruction among the greater portion, are the causes why sufficient attention is not paid to the fluctuations in the foreign markets. 2. Our farmers confine themselves too much to raising wheat and other grains, and do not engage sufficiently in stock-raising; and in stock-raising they do not select what pays best. Respecting dairy purposes, large animals cannot be selected; their nourish-

ment costs too much. It is the contrary if it is desired to export meat; then large animals are a necessity. 3. It would be a great advantage to our farmers. Every time I sowed imported grain my harvest has always been more abundant. Nevertheless, several have been deceived in the purchase of wheat; they bought fall wheat instead of spring wheat. 4. I think that the inspection of butter and cheese would be a great benefit to the farmer, because only what was good would be sold, and we would obtain a good price for it. 5. Such importation could not but be very useful. If nothing had ever been imported from the old countries, our Province would not have had as many fruit trees as it has. 6. The appointment of an analyst might be very necessary, but it is not what I would most desire to see. It sometimes happens that these appointments are made where they ought not to be. It would be a useful thing if the person appointed was competent. 7. The establishment of such a garden or farm would be very useful for us, and I might say that this is absolutely necessary, perhaps indispensable, for us. 8. During the past few years the crops have suffered severely from insects. 9. The wheat has suffered much from a small insect, called the small white worm; the hay has been eaten by a small fly called here the flea. The beans have been almost entirely killed for three consecutive years; they were devoured by a blue fly. During the past few years our potatoes have been saved—thanks only to Paris green. Every one knows the insect called the potatoe bug. 10. I do not recollect if any steps have been taken to protect vegetation against those insects. 11. I cannot state precisely the damage caused by these insects; but I am able to state with certainty, that within the space of one week the blue flies have devoured, on my property alone, a bean patch worth sixty dollars ($60); they carried everything off, and so it is with the other crops when these little insects make their appearance. When hay is attacked by the flea its value lowers at once by one-half. Hay usually averages one ton to the acre. 12. During the past few years our sugaries, as well as our orchards, have been devoured by caterpillars. They ate all the leaves, and killed a great number of trees. 13. I think that the appointment of a person qualified to instruct us about birds, beneficial and injurious, would be a good thing for farmers. 14. For our locality I see no great need for a system of inspection to ascertain the diseases among animals and poultry. 15. Very far from it. 16. Nothing of the kind has been done to my knowledge. 17. Attempts at tree-planting have been made of late years. All have not succeeded. The trees planted should be suited to the soil in each case. Thus, maples should not be put where ash or cedar would be the proper thing. Our people think only of planting the trees they fancy most, without reference to the kind of soil. 18. I think all farmers would derive benefit from the establishment of such a Bureau. 19. The distribution of pamphlets instructive for the people, is always popular, would do good and greatly help to improve the farming class. 20. I strongly recommend the establishment of such a Bureau, and farmers could no longer say they are led astray by the newspapers, as they now often say. 21. It undoubtedly would be more than an equivalent for the expense involved.

P. R. PELLETIER, *Farmer.*
ST. CÉSAIRE, ROUVILLE, P. Q.

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1. The great defect is that our farmers follow no system of rotation. Another is the poor quantity of our seed and stock. 2. We grow grain year after year with hardly a year's interval for rest; hence comes exhaustion of the soil and the fact that we never have plump, clean grain. A beginning has been made as to improving our stock. A proper care of manure is entirely neglected and is, in fact, a thing unheard of. 3. It would not be beneficial to import seeds from foreign countries, in my opinion, more especially those seeds which have been

so highly vaunted and which are worthless here. Good seed grown within a distance of say 30 leagues, are the seeds that grow best. 4. I think so. 5. Yes, very useful and would certainly succeed. 6. It might be of some use, but it is not of urgent necessity. 7. Without any doubt. It is better that the experiments should be made by the Agricultural Commission than by the farmers. 8. The injuries inflicted by insects are steadily increasing; whole crops are thus often lost. 9. The wheat is destroyed as soon as it appears. It is also devoured when headed out. The peas are eaten in the pod. The apples are also injured by a worm which attacks the fruit at the heart. 10. But little has been done as yet. 11. The general losses on grain and vegetables are enormous. Here wheat is largely destroyed by insects as soon as it springs up. 12. Only the apple trees. 13. Yes. 14. The need of this is not felt here as yet. Our cattle are, as a rule, free from disease. 15. The forest is steadily disappearing. Firewood is becoming scarce. Tree plantations are numerous. 16. No answer. 17. Trees are planted in front of the houses and along the road. Some persons have begun planting maples for sugar. 18. I do not see what advantages our farmers would derive from it, at least just now. 19. I think so; but the information should be given in a style which farmers would understand. 20. The advantage would not be sufficiently general; a farmer here and there might benefit. Besides, the newspapers already furnish the information mentioned. 21. Let the agricultural papers subsidized by Government be entrusted with that work. 22. I have conducted successfully a large farm. My success has always surpassed my expectations. However, I do not feel warranted in giving advice.

REVEREND LS. ELIE DAUTH,
Parish Priest, Upton, Co. Yamaska, P.Q.

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1. A want of practical instruction. There is nothing but routine. We should have a farm subsidized, say by each rural district, where the farmers could learn by example, and where they could procure grain and seed at a low price. 2. Too numerous to mention. Every thing is yet to be done. Reforms have now been urged for many years, and seed grain furnished, and yet progress is very slow. Something is needed to give things a start. 3. Yes, and I think, especially seeds for the various pasture grasses. These are sold at too high a price and yet they are the basis of the production of milk for the butter and cheese factories. 4. Yes, I think so. 5. The Horticultural Society of L'Islet has made the experiment this year, by presenting to each of its members twenty-five apple tree scions. 6. Yes, particularly if he were enabled to receive and return the samples free by mail. 7. Certainly. 8. The imported sparrows are beginning to plague us. Potatoes still suffer from the bug. Last year we had an insect, which I believe to be the army worm, in large numbers. 9. Potatoes. 10. Our efforts are confined to the potatoe bug, and the caterpillars on the fruit trees and currant and gooseberry bushes. 11. No. 12. Yes; particularly the spruce. 13. Probably. 14. No answer. 15. Yes. 16. No; except by a few amateurs. 17. There are many apple plantations. Within the last two years a few persons have planted Giguère maples, a few black walnuts, sugar maples, and spruce trees; and so far their efforts appear likely to be successful. 18. No answer. 19. An excellent effect. 20. Yes. 21. Yes, I think so. 22. The statistics should, I think, be gathered from the Councils of the agricultural societies. Each Director should answer for his locality, and assume responsibility for the accuracy of his statements, otherwise the statistics might be unreliable.

H. J. J. DUCHESNAY,
La Beauce, Beauce, P.Q.

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1. Mainly the want of scientific agricultural education, which a sufficient number of agricultural schools and colleges, with experimental farms, would supply. 2. Often the want of technical knowledge, which agricultural education should supply. 3. Yes. 4. Probably it would. 5. Yes; some of our most valuable fruits have been introduced in this way, and it is but reasonable to expect that others might be discovered that would prove of equally great value. 6. Yes; at present farmers have no means whatever of gaining such information as they require, and would often gladly avail themselves of, if such an officer were appointed. 7. Undoubtedly; if one or more were established in each Province, which would be necessary to ensure satisfactory results. 8. No, in reply for birds; insects, yes. 9. Wheat is injured more or less by the midge or weevil. Potatoes are threatened by the Colorado beetle, which made its appearance last season. The canker worm has made havoc with the apple crop in a few orchards. The apple tree caterpillar has to be closely watched to prevent complete destruction of crops in some localities, but only requires vigilance on the part of the orchardist to control. There is also an insect that has in some cases attacked the blossom with serious effect. The curculio injure the plums and cherries to some extent. 10. Individual interests guarded in a greater or less degree. 11. Perhaps no country is more free from these pests than is Nova Scotia; yet insects are undoubtedly on the increase. In the above list of products, which are all more or less grown, the cabbage and currant require more protection from enemies than any other. 12. No. 13. Yes; much information is required to enable farmers to contend successfully with the increasing insects. 14. It would be advisable to have local agents throughout the country, whose duty it should be to inform the proper authorities of any appearance of disease among farm stock, and in case of infectious diseases immediate steps could then be taken to deal with it, as appeared necessary. 15. No; coal is largely used as fuel. 16. No. 17. No answer. 18. Undoubtedly! yes! 19. Yes; would prove of great value, no doubt. 20. (1st.) Yes. (2nd.) Showing the resources and supply of the country would enable the agriculturist to make comparisons that would govern the productions and disposal of his crops to the best advantage. 21. Yes. 22. My experience has shown that the general subject of the foregoing questions is of the greatest importance to the agricultural community, upon whom the prosperity of all classes must depend, and the importance of the fostering care of the Government cannot be over-estimated.

C. R. H. STARR,
Farmer and Fruit Grower, Secretary Nova Scotia Fruit Growers' Asssociation, Port Williams Station, King's County, Nova Scotia.

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1. Unable to answer as regards British labour, beyond stating the fact that wages are so high here that agricultural improvement, under present circumstances, is much retarded. 2. In British Columbia, cultivation and stock-raising are carefully prosecuted and with great success. Fruits of the first quality are raised on Vancouver Island and the Lower Fraser, but so far, not with marked success in the upper country. Fertilizers in ordinary use—barn-yard manure, fish refuse, sea-weed occasionally, and recently dried fish scrap. 3. The importation of choice seeds would be a boon to many farmers, who would, I think, cheerfully purchase in moderate quantities, even at an advanced rate. 4. Not in British Columbia, where the local product is chiefly consumed within the Province. 5. Probably as regards some portion of the Mainland; but lower down and on Vancouver Island the finest varieties thrive. 6. Not at present in British Columbia. 7. Decidedly. Any movement in that direction would be, in my opinion, most advantageous. 8. No. 9. No. 10. I believe that all our birds are indirectly beneficial to agriculture; but many farmers, provoked by occasional damage to fruit or grain, and ignorant

of the good service the birds render at certain seasons, wage war against them, nothwithstanding that there are special local laws for their protection. 11. No. 12. No. 13. Scarcely in British Columbia; at least at present. 14. Not requisite here under present circumstances. 15. Yes. 16. No; not being yet necessary. 17. Ornamental trees of divers kinds have been successfully introduced, and are much prized. Some varieties of the eastern woods might be advantageously cultivated for useful ends; for instance, the sugar-maple, the hickory, the elm, &c. 18. Questionable, as regards British Columbia, at least at present. 19. Partially in British Columbia; possibly greater, as I conceive, in the older Provinces. 20. Questionable, as regards British Columbia at present. 21. In any case I conceive that a yearly publication would be preferable. Monthly reports, from their very frequency, would probably attract little attention. 22. The importation of valuable seeds, such as the improved varieties of vegetables, small fruits, &c., and choice samples of cereals (such as is practised by the Bureau of Agriculture at Washington, U.S), would, I think, be highly beneficial. The smaller seeds, &c., to be distributed gratuitously by mail—the cereals, in larger quantities, to be paid for, as stated in article 3.

ALEX. C. ANDERSON,
Inspector of Fisheries, Victoria, British Columbia.

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1 to 13. No answer. 14. Yes; they should be extended to include glanders in horses and anthrax in cattle; trichinæ and measles in pigs. A system of inspection should be extended to the North-West Territories (See report of Department of Agriculture). 15 to 17. No answer. 18. Yes. 19. Yes. 20 and 21. No answer. 22. Yes.

D. McEACHRAN, F.R., C.V.S.,
Veterinary Surgeon, Inspector of Stock, &c., Montreal.

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1. First, from the farmers not having a thorough knowledge of chemistry, which should be taught in our common schools, that he may understand the analysis of our different soils, grains and plant growth; second, in not having Reciprocity with the United States. 2. (1) Wheat decreasing in yield. (2) Potatoes, decreasing in yield. (3) Apple crop inferior in yield and quality. 3. Yes; if judiciously chosen from countries of equal or more vigorous climate than our own. 4. Yes; if honestly and intelligently performed. 5. Yes; without doubt, and especially so if judiciously chosen. 6. Yes. 7. Yes; it is one of the needs our country has felt the want of, for some time. 8. None from birds, but from insects, yes. 9. The potato from the Colorado potato bug; the apple from the codling moth, aphides, tree borer, and other insects, also from scabbing of fruit. 10. None of any consequence, excepting in some cases the use of Paris green for the potato bug, and pasturage of orchards by hogs and sheep for the codling moth. 11. Potatoes, 30 per cent. loss from Colorado bug; apples, 50 per cent. loss from insects and scabbing of fruit; cabbage 40 per cent. loss from cabbage worm; plums, 50 per cent. loss from curculio, currants, 50 per cent. loss from currant worm. 12. The sugar-maple has suffered to some extent from the borer. 13. Yes; without question. 14. No answer. 15. For shade, yes; for fuel, if used economically for domestic wants, a lack of pine, cedar, oak and like timber. 16. None. 17. None. 18. Yes; without doubt. 19. Yes; especially in that part of the country where the public are a reading public. 20. Yes; it would serve as a guide to the producer what to grow for expo t as well as for home consumption, giving him the choice as to which he considered the most profitable. 21. I should judge so. 22. I beg to suggest that the Bureau take means to impose and enforce penalties on

such municipalities as neglect to take action in keeping down and preventing the spreading of noxious weeds on the public highways, including railways, and elsewhere within their jurisdiction.

JOHN M. FISH,
Farmer and Nurseryman, Abbotsford, Rouville, Que

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1. No answer. 2. (1) Want of periodical change of seed and rotation of crops. (2) Want of suitable artificial manures and proper cultivation. (3) Long winters; stall feeding. (4) Ignorance as to the proper manufacture of these articles. (5) Failure of many kinds tried and not found suitable to climate and localities. (6) Artificial manures being sold without analysis are not found to be as represented. 3. Certainly it would, if judiciously chosen. 4. Most undoubtedly it would. 5. It would, provided a judicious choice is made by parties who thoroughly understand our climate, circumstances and wants, and who have made a study of this important subject. 6. Such an appointment would be of great advantage to farmers, provided the fees charged were nominal, and that the analyist, from his known ability and past reputation, was entitled to their full confidence. 7. This is much wanted; but as the climate varies so much in the Dominion, I consider there would require to be at least two, one in each of the Provinces of Ontario and Quebec, as the result of experiments made in our Province would be of little practical use for the other. 8. Yes. 9. Potatoes only, from the Colorado beetle. 10. The usual application of Paris green, or London purple, mixed with plaster, for the above. 11. No; I think the loss insignificant where means have been taken to prevent depredations. 12. No; there are no timber trees in my district. 13. I certainly think it would. 14. I think the present system of veterinary inspection of stock in quarantine sufficient, but there is wanting a Government official with whom to consult and make known any cases of infectious disease among farm stock or poultry, and the necessary regulations for dealing with such. 15. No. 16. No. 17. No such attempt has ever been, or is likely to be made, in my neighborhood, unless the law makes it compulsory. 18. I think it would, judging from what I have heard and read of valuable work done by what I suppose to be a similar Bureau in Washington, U. S. 19. No doubt, such would have a beneficial effect; but if scattered broadcast and distributed gratuitously, I do I do not think the benefit would be equivalent to the cost, as thousands of copies would be thus thrown away. I would suggest that in the event of such being done, they should only be given to members of agricultural societies and all other parties be required to pay for them. This would ensure the papers falling into the hands of those taking an active interest in agriculture. 20. A "section" of this kind, through which reliable agricultural statistics could be procured, would be of very great public utility. 21. Not to the agricultural community. 22. The benefits to be derived from such a Bureau would be so general that it is difficult to point out the numerous ways in which it would promote agricultural interests.

J. M. BROWNING, J. P.,
Vice President Council of Agriculture, P. Q., Agriculturist, Longueuil, Chambly, Que.

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1. When well employed, our season is long enough for *ripening* and *harvesting* the crop, but we labour under one *great disadvantage* in this Province, owing to the length of time the snow remains on the ground; we have got very little chance to drain, clean and mellow our lands and set them in good order, as compared with other countries where the winter is shorter. 2. No answer. 3. Every farmer knows the advantage of frequent change of seed; seed from foreign countries, well and carefully chosen, would be a great benefit to them.

4. It certainly ought to. 5. It would be of great service. 6. I think so. 7. Yes. With good and intelligent management, such a farm would render great services. It is not easy for our farmers to make such experiments (even if they were willing and able to risk them), but they would watch them with much interest, and would not be slow in appreciating the results and benefitting by them. 8. Yes; especially for the potatoe crop. 9. Potatoes from the potatoe bug, and gooseberries and currants from the caterpillar. 10. Paris geen for the potatoe bug, Hellebore for the gooseberry and currant caterpillar. 11. No answer. 12. Our tamaracs were, for the first time, covered with caterpillars, and the tender shoots nearly all eaten off, but I do not think the trees have been killed; we shall find out next summer. 13. Certainly. 14. No answer. 15. No; there is a great scarcity of timber and fuel, and many of our farmers suffer terribly from it. 16. Scarcely, but public attention is beginning to get roused, and on our Arbor Day last spring, a very large number of ornamental trees were planted, but not, of course, on a large scale anywhere. 17. I know of attempts being made to introduce the black walnut in our Province, which, after ten years' experience, are very satisfactory and promising; many people are now growing them. Hundreds of thousands of seeds of the ash-leaved maple (*acer negundo*) have been sown last year, as it has been ascertained, from several years' experience, that it succeeds very well here. 18. The Experimental Farm, mentioned in the seventh question, would appear to me to be more useful than anything else. 19 to 22. No answer.

H. G. JOLY, *Quebec.*

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1. Our natural market, the United, States absorbs $15,000,000 of agricultural products on which $3,000,000 are paid as duty to the United States. The French market is practically closed against Canada for want of direct communication and surplus tax of $7.50 a ton on products imported through a foreign port, also for want of the most favored nation treatment. 2. Fertilizers should be subject to inspection by the Government chemist, and their fertilizing qualities known to purchasers. Superphosphate of lime especially, which can be obtained at a reasonable price, should be subjected to tests and inspection for use in Canada and abroad. 3. It is done extensively by the United States Government. The importation of Black Sea wheat has been done on a large scale by myself (1,500 bushels) in 1869. I produce the sworn statement made before the British Consul General of Odessa, that the wheat imported was superior to anything then in the market. 4. The inspection and branding for exportation would certainly enhance the value, as purchasers abroad would have a guarantee of obtaining a superior article when delivered. 5 The fruits of Canada are known all over the world for their superior excellence; some specialities might be imported, but the most important work would be the multiplication and wide distribution of the best home varieties through every part of the Dominion. Canada is large enough by itself to provide for this interchange of varieties. 6. An agricultural chemist is attached to the Agricultural Bureau at Washington and his annual reports amply show what great results may be derived from his services. As a first step, the Government chemist attached to the Geological Survey of Canada might, with advantage, devote part of his time to agricultural subjects as well. 7. This is done extensively in Washington, where the agricultural grounds surround the buildings of the Agricultural Bureau and Smithsonian Institution. Vast hot-houses propagate millions of plants for distribution. Every home tree shrub or plant is to be found in the garden properly labelled, and a large number of foreign plants suitable to the climate of the United States are also to be found there. The Government grounds in Ottawa might be ornamented in the same way. 8. The imported sparrow is fastly becoming a nuisance all over the country, by building its nest in the spouts and other places where the accumulation of water is the

cause of considerable damage during the frosty winter weather. Insects have also given some trouble, specially the potatoe bug, called Colorada beetle (*Chrysomela decemlineata*). 9. Other insects attack the peas, wheat currants, and hay. Paris green is generally employed against the potatoe bug. 10. No answer. 11. No answer. 12. No answer. 13. This work is most efficiently done by the Washington Antomologist and if a reproduction of his reports adapted to Canada was published, we would be largely benefited, the two countries being one in an agricultural point of view. 14. Again every infectious disease from which we suffer is common to the United States as well as Canada, and has been most thoroughly reported upon by the Washington Department at a large expenditure. I produce some of these reports fully illustrated. A compilation of these reports by the Government Veterinary Inspector in charge of quarantine would be ample for all practical purposes, as there is no object in doing the work over again. 15. Shade trees are very much wanted; timber for fuel is becoming scarce and a source of increasing expenditure. 16. Some interest has been developed in tree planting in the Province of Quebec, by the adoption of Arbor Day, through the Quebec Forestry Association, of which I am secretary. In every city, village, town or township or school, the planting of shade trees is now an institution and will bring about very considerable results. 17. Several attempts have been made to plant trees for timber purposes, the most successful being that of Hon. Mr. Joly's black walnut grove at Point Platon; the other experiments are not old enough to give immediate profitable results. 18. Canada being specially an agricultural country, should long ago have the substance and not the shadow of an Agricultural Bureau. The Minister of Agriculture of Canada has a large yearly appropriation, of which not a cent is spent for the promotion of agriculture. In Washington half a million is appropriated yearly and devoted exclusively to agriculture, the results being immense: no country has done more than the United States for the promotion of agricultural interests. Their yearly report is the most complete and practical now published by any Government. 19. A compilation of these reports by a competent agriculturist and adaptation to our circumstances and published broadcast would put us on a par with our progressive neighbors. 20. We are absolutely in the dark on the agricultural statistics of Canada, although they are of the highest importance to the commercial and agricultural community so as to regulate our production according to the demand and supply; by taking advantage of our five hundred agricultural societies, these statistics could be obtained at a very reasonable price. The director in each township would fill up the blanks, taking as a basis the last Census. The secretary of the county society would compile these blanks and transmit them to the statician for each Province, who would control the reports and group them properly before transmitting them to Ottawa for final control and publication. 21. No answer. 22. It is only necessary to know what immense results have been obtained by the Washington Bureau to come to the conclusion that an increase of 25 per cent. of the agricultural productions of Canada would soon follow its adoption in Ottawa.

J. X. PERREAULT,
Pupil of the Royal Agricultural College of Circenster, Gloucestershire, England, and of the National Agricultural School of Grignon, France.

OTTAWA, 20th March, 1884.

DEAR SIR.—I send herewith my note for the use of your Committee. I return to Montreal on Monday, a.m., where I shall be happy to serve you or your Committee in any further way in my power.

Faithfully yours,

G. A. GIGAULT, Esq., T. STERRY HUNT

OTTAWA, 22nd March, 1884.

SIR,—I have the honor to acknowledge the receipt of your letter of the 21st, asking for an expression of my views on certain points submitted by your Committee.

As regards the establishment of a Central Bureau of Agriculture and Forestry, with a proper staff, capable of giving advice, of making or directing inquiries, and of diffusing knowledge of new and important matters connected with field and forest culture, I think it might be made of great use to the Dominion. I need not insist upon the attention which should be given to the subject of domestic animals and their various products by such a Bureau, nor upon the importance of skilled entomologists, who should instruct the people as to the facts known about insects injurious to vegetation, or either directly or indirectly beneficial thereto.

I think the services of one or more trained botanists for such a Bureau would be necessary to obtain and make known information as to the growth and geographical distribution of our native trees, shrubs and plants, and as to the value of those of other regions which may be fitted for introduction and cultivation in various parts of the Dominion. With such studies in practical botany should be connected a botanical museum, showing all the products of the field and the forest, with their uses, so far as concerns our own and similar climates.

With such an Agricultural Bureau there should also be a chemical laboratory, with a competent chemist, to make, when necessary, studies of vegetable and animal products, and also to examine and report upon foreign and commercial fertilizers, and to give directions relating thereto to the various public analysts throughout the Dominion.

I have been asked how far the study of the soils of the Dominion should be referred to such a Bureau, and whether this could not be better done by the present Geological Survey. To this I reply that such study should form an important part of the legitimate worth of the Geological Survey, and can only be properly carried out in connection therewith. The investigation of the various soils and sub-soils, their classification, and their comparison over the vast area of our Dominion, is closely related to the study of its physical geography and its geology, upon which the nature and the distribution of the soil depends. With these are to be considered the various natural fertilizers, such as phosphates, gypsum and marls, which are so important to our agriculture.

Not less intimately connected with the geology of the country is the study of the natural waters, both superficial and subterranean, considered in relation to manufactures, to domestic economy and to agriculture. This subject assumes a special importance in connection with the comparatively arid lands of parts of the North-West, where the sinking of wells and the obtaining of water proper for irrigation and other purposes are matters of great moment. In this connection, the salts of the alkali plains should be carefully studied, since as is well known these salts vary in nature in different areas, being sometimes instead of worthless or noxious matters, substances of great economic value. The investigation of all these questions demands not only the services of a skilled chemist, but the co-operation of a geologist familiar with the structure of the country, and should receive the special attention of the Geological Survey, which could thus most effectually co-operate with the Department of Agriculture.

On the other hand, the botanical and other natural history investigations now connected with this Survey, might, in my opinion, so far as they have a practical value, be transferred to the Department of Agriculture itself with great advantage to that Department and to the country at large. Their work would thus form an important part of that of the proposed Bureau of Agriculture.

I have endeavoured in the above remarks to embody some of the suggestions raised by your inquiries, and shall be pleased to answer any further questions.

I have the honor to be, Sir, your most obedient servant,

T. STERRY HUNT, *C.E., of Montreal, P.Q.*

To G. A. GIGAULT, Esq.,

Chairman of Committee on Agricultural Interests.

Translation.

1. The Agricultural Societies now existing do not fulfil the end for which they were created. The money spent in this way might be spent in part more advantageously for the development of agricultural industry, and especially the dairy and beet root sugar industries. It is useless to raise grain for foreign markets; labor is too scarce and too dear, and competition with the west is impossible. 2. The greatest defect in the raising of grain is that the French Canadian farmer generally raises too much grain in proportion to the manure at his disposal. It is of the greatest importance that he should increase his herds of cattle, more especially of milch cows. The farmer sows the same crop for too many seasons consecutively. He finds it difficult to procure new or foreign seed in place of what he generally uses. The cultivation of fruit, roots and herbs is too much neglected, owing to the want of knowledge requisite to carry on this branch of farming to advantage. The cultivation of horse-tooth Indian corn, or sorghum, for green fodder in summer, when the pastures have failed, gives the best results when it is kept green in pits, chopped up, and well pressed. I have myself tried this plan and have succeeded well; the practice is not followed as it ought to be. On most of the farms in the Province of Quebec I do not think that, in general, the raising of stock for meat would be very profitable, but consider that the dairy products would suit better. It is, therefore, important to introduce into the Province a breed of cattle more particularly suited for producing butter and cheese than meat. It is necessary to improve our sheep, in order to gather finer wool, so as to support our manufactories of Canadian cloths, which now import fine wools from the United States. A large amount of manure is completely lost on the farm and in the cities; excrementitious matter and scrapings from the streets, which might be converted into excellent compost, are now lost from want of care, and the necessary means for its storage, and its judicious employment. A considerable quantity of matter which might serve to make excellent artificial manures, such as fish refuse, &c., is lost every year on the Gaspé coast. Twenty thousand tons might be made from it each year. The great fault in the employment of manure by the farmer is the placing it in small heaps, instead of spreading and burying it; by acting as he does and leaving it exposed to the sun all the summer, it loses by evaporation the greater part of its value. I have seen this done in the counties far distant from Montreal. Such conduct deserves to be placed among the mortal sins. 3. Yes. 4. I do not think that the dairy industry, especially butter making, is sufficiently advanced to allow of the appointment of general inspectors, more especially as it would be very difficult to meet with a sufficient number of competent persons to carry out these duties in a just and rational manner. The money spent on inspection would be, I think, more wisely devoted to the establishing of an experimental dairy, where the respective values of the implements and apparatus used in the manufactures would be scientifically studied in such a manner as to meet the requirements of those wishing to export their products. This ought to be the starting point. It is also of the utmost importance to disseminate the information necessary for the establishing of butter and cheese factories; because the establishment of butter and cheese factories is the only true way of improving the dairy industry of this country. Inspection may follow later on. 5. I think so. 6. Yes, certainly, the values of home and imported fertilizers ought to be known, in order to prevent the farmers being deceived. 7. The establishment of an experimental farm, where trial might be made of foreign fertilizers, of different kinds of fruits, trees and vegetables, and new varieties obtained from the seed plot, as is done at the school of Lansing, Michigan, U. S., would be very advantageous to the farming class. The power of testing the most modern agricultural implements would also be of great assist-

ance to the farmer. 8. Insects injure greatly the wheat crop. The potato bug makes great havoc among the potato plants. 9. The wheat is infested by the wheat fly; the peas are also attacked by a fly; as regards fruits, the question is beyond me. 10. The best means of protecting vegetation is to protect the birds. 11. The proportion damaged by insects during an interval of five years, may be reckoned: Of wheat, at 30 per cent.; of potatoes, 40 per cent.; of cabbages, tomatoes, turnips, gooseberries, at 10 to 12 per cent. 12. I cannot make any very positive statement. 13. Yes, certainly. 14. In view of the existence of infectious diseases causing considerable loss among cattle, sheep, and swine in Europe and the United States of America, and inasmuch as we are liable to have these diseases introduced into our country through imported animals, it is of the very highest importance that the Government should take all necessary means to prevent the introduction of these diseases, and to combat their diffusion. 15. There is not sufficient, either for shade, for firewood, or domestic purposes. 16. Some trees have been planted, but not in sufficient numbers to deserve special mention. I am under the impression that a premium granted for the planting of trees would do good. 17. Maple, soft maple, and elm trees, have been planted in the gray clay soils along the road side; generally they have succeeded well. 18. The creation of a Department, whose head would have the same powers as the Superintendent of Public Instruction, who would collect all the information possible on matters affecting agriculture, and who would control a staff capable of giving advice, noting improvements perfected here and in foreign countries, who would look after the rational employment of monies appropriated for agricultural purposes, would certainly be very advantageous, and would fill a void which has unfortunately existed for a long time in this country. 19. Certainly. 20. Yes, I think so; but the matter might be put off until later on. 21. Not at the present moment. 22. The best advice I can give to the Central Bureau is to improve and develop agricultural industries, especially the dairy and sugar beet ones. By raising the sugar beet, one would obtain leaves for milch cows in the autumn, and pulp in winter, and consequently a greater number of milch cows might be kept. I cultivated the sugar beet on a large scale for three years for the Coaticook and Berthier companies. But unfortunately these companies never paid the farmers for their roots, and did great injury to this industry. I will communicate to you the result of my slight experience in this cultivation. I did not cultivate the root as it ought to be cultivated, nevertheless I raised beets that I caused to be analyzed, which gave 14½ per cent. of sugar. I am convinced that, with proper cultivation, one could manage to raise beets containing 15 to 18 per cent. of sugar. To do this, deep ploughing of 15 to 18 inches is requisite, as also a sub-soil plough. The land must be well drained, with drains extending beneath the greater portion of the land, and the whole well fertilized one year before sowing the beet root crop. With the same conditions, our grain harvests would double in yield, comfort would be found throughout the land, our Province would be placed in the first rank among the other Provinces in America, we would do our part in contributing to make Canada a country worthy of the great Empire of which it forms an important part. If France was enabled to remove the iron yoke of Prussia, by paying a ransom which the world considered impossible for France to do, it was owing to her agricultural products, and especially to the beet root industry. The principal resources of our Province of Quebec are to be found in its timber limits and Crown lands, which are slowly becoming exhausted. It is not wise to wait until our principal resources are completely exhausted before creating another source of revenue. By establishing the industry and manufacture of beet root, on a solid basis, it would assist later on in lightening our Budget. To effect this, a perfect technical knowledge is required, and a perfect skill in business on the part of the directors of our beet root sugar factories, and a capital sufficient to enable the company to cultivate, itself, one-

half of the roots required. A large farm would be necessary, on which steam ploughs would be used, which act well in England, and which would lessen the net cost of the beet root nearly one-half. The residue of the sugar refineries could also be profitably used. The farmers would also learn how to make this industry profitable as well for the agricultural population as for the stockholders. Such, in my opinion, is the best way of improving agriculture. In order to raise beet root, fertilizers are necessary; to obtain manure, animals are requisite; in order to feed cattle, the green forage coming from the pulp of beet root is required. In this way agriculture, manufactures and commerce are linked together, and hold each other's hands. Riches will follow. You will pardon me if I have been somewhat prolix, and you will excuse, perhaps, the faults of language which I have committed. I am not a literary person. I am more accustomed to guide the plough than the pen. I have still many things to say in the matter of agricultural industry, and particularly beet root sugar, which is the source of wealth in the north of France, Belgium and Germany. I had an interview with Mr. Legou, before his departure for France. He intends to return at the end of the month to establish himself in Canada. He was sent out by Mr. Déprez, who has beet root sugar factories in France. He says that he intends to raise beet root on a large scale, and will examine steam ploughs while passing through England. He says that he has capital enough to cultivate it extensively. A company which would undertake to cultivate a portion of the roots it requires, and would furnish guarantees, would deserve encouragement from the Government.

J. BAPTISTE LECOURS, *Farmer.*

ST. LAURENT, JACQUES-CARTIER COUNTY, 5th March, 1884.

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1. In this section of the Province, wherein all the old lands are impoverished, the defects of the present system of agriculture, or rather those attributed to it, arise from the precipitancy with which it was adopted. Too many theories were preached up at once, some of which had succeeded elsewhere, but which, for us, could not, at the time, offer any practical result. Our country population, so attached to the routine of agriculture, and credulous as they may be in other matters, cannot break suddenly with the past, in order to take up new theories and methods. There is nothing but the proof of the data of agricultural science by practice, and their sanction by the experience of a certain number among us, which could persuade our farmers to enter upon the new course that was traced out for them. Agriculture, the basis of one of our best industries, ought to be progressive without seeking for improvement all at once. With sufficient capital in the hands of the farmers endowed with the necessary knowledge, the system would have come, as a matter of course; its foundations would have been solid, inasmuch as they would have rested upon paying bases. In my opinion, as regards agricultural instruction, they have commenced by the end, instead of proceeding from the beginning. The first elements of this science have not been promulgated or taught. By means of newspapers, pamphlets, &c., only the refined deductions of the science have been taught, if I can so express myself, and by making use very often of incomprehensible forms or expressions, that is to say, beyond the reach of those to whom they were addressed. Let inspectors be appointed, charged with making a report; let them go through the country; we will know then that agriculture has not made everywhere the progress that was expected of it. Before preaching up any system of agriculture, it would have been of more consequence, it appears to me, to have learned to know the soil, to study and understand its nature, its capacities, its needs, even its requirements; the composition of the plants in connection with that of the soil which produces them with the greatest success; the difference of consumption for the support and fattening

of animals of large breed (too much cried up) compared with that of Canadian animals. All this ought to have been made the subject of serious study, before inducing any person to enter a course which was unknown to him. Furthermore, it has not been sufficiently shown to the farmer the numberless advantages which flow from the use of improved ploughing machines, as much to stir up the soil, to cleanse it from noxious weeds, so as to save labor, etc. Implements of this kind ought to be offered more frequently as a reward to the inhabitants of the localities where the need of displaying the ability of such implements is most felt. In fine, according to me, the same system of agriculture has been preached as suitable for every body, for all purses, for all places, and for all lands. No allowance has been made for the extent and atmospheric difference of the country. The natural forces of the soil have been exaggerated or badly calculated, and the means for supplying its needs, by fertilizers, either natural or artificial, have not been sufficiently considered. The nearness or distance of the markets ought to count for something in the adoption of a system of agriculture. The existing system of agriculture, while it has brought about great reforms in certain parts of the country, has been the cause of many mortifications for a great number of farmers, who, not being prepared, desired to make trials on too large a scale. The guarantee of the success of the agriculturist rests, according to me, in more perfect apprenticeship, and knowledge of the agricultural sciences; in the assiduous care taken in the kitchen-garden, in the more intense and consequently more careful cultivation of the land. Furthermore, the greater the number of improved implements of husbandry that are procured, and the more that use is made of them, the greater the certainty of success. If, then, attention is given to the raising of our small Canadian animals, especially to that of our Canadian cow—if the breed is improved by judicious and intelligent crossings, the success of our butter and cheese factories will be only the more assured. If the farmer learns to treat well and to take good care of his animals, and if he continues to improve his produce, I do not see what the disadvantages will be to which he will be subject, when he enters into competition on foreign markets, if it is not the want of inspection made in advance by a competent person. 2. The land is too little worked over, the ploughing is too superficial, made in haste, often at unseasonable times. The harrowing leaves much to be desired—one often sees wooden harrows. The ditches and trenches, &c, are neglected. Noxious weeds appear in masses in many of the fields. In general, the stables are not sufficiently spacious or well lighted. The ventilation is faulty, and cleanliness is not the order of the day. But, in general, animals are better treated than in the past. Fresh manure is employed too much on the surface without been buried in the earth. 3. I am positive of it. 4. Such an inspection made by a competent man, would certainly increase the value of all produce. 5. Necessarily so, but the reproduction or cultivation of these grafts, plants, &c., ought to be tried in various parts of the country. 6. The country would gain much by the appointment of such an officer. The analysis of the soil and fertilizers is the first step to take in the direction of sound agricultural science. 7. The establishment of experimental gardens or farms is not only useful but indispensable to the advance of agriculture. Under the direction of cultivated, skilful and practical men, these establishments render immense service in all the countries where they are met with. Here where the field of experiment has only, so to speak, been skimmed over by the amateur agriculturist in good circumstances, it is very opportune to build up establishments of this kind. Looking, however, at the extent of the country, its variations in temperature, their operations cannot be centered in one locality. There must be two or three establishments in the Dominion, unless their directors, in some way or another, should encourage, in various localities throughout the country, trials by private persons bound to report to the central

office. In agriculture, theories are not within the scope of everybody, they may even deceive persons. But practice is infallible. Demonstration by means of successful trials is the best of schools; its lessons travel quickly and they are permanent. The gardens and farms in question, established on more solid bases, and more practical than the majority of our agricultural schools, would render immense service. The choice of the site of such a farm is very important, as much with respect to the cost of the ground, the buildings, and the expense of maintenance, &c., as in respect to the general advantages which may result from it. Lévis or Quebec, where the Government possesses, I believe sufficiently extensive landed property, offer, perhaps, in this connection, greater guarantees than any other localities. If the land is there, there also will be found an immense quantity of manure arising from the quarantine of animals, which can be utilized. In the second place, all the foreign plants which would vegetate in this part of the country, would easily develop there, would ripen their produce there, in fact, all those which would adapt themselves to our climate, would furnish in this way guarantees of acclimatization for the other places in the Dominion. The check experienced in the planting of fruit trees, comes from a want of acclimatization of the plants, and the too unfavorable conditions given them when transplanted, compared with those they possessed previously. The plants of cold countries, and those brought up on this side of the southern boundary of the district of Montreal, are the only ones suited for our country. But there is no doubt but that the trees which would succeed at Quebec, would do the same in other parts of the country. The plants raised here would show themselves always strong and vigorous; they would suffer less from transportation; their condition would be always improved. Do not let us renew the disasters of the past by a trial of plants brought from Rochester or its environs. May our operations at least take a right direction. 8. Not in our locality, except in the case of the potato. Wheat is but little cultivated, and its place is taken by peas or cabbages and other vegetables liable to be attacked by worms, &c. Here there are only a few isolated orchards. The apples suffer much from the ravages of the codling moth. 9. No answer. 10. Not so far as I know, except for the potato bug. 11. These losses are inconsiderable. 12. Yes, to a considerable extent, this year. 13. Yes. 14. Such is my opinion. 15. In our locality, for shade in the fields, no. For firewood and ordinary purposes, yes. 16. No. 17. On the lands I cultivated with my son at Beaumont, we have during the past two years planted at least 400 trees, of which 250 were walnut trees, the produce of nuts sown some three years past, nearly 75 red spruce and red maple, and the balance in ornamental trees. The walnut trees and red spruces were planted along the line of the fences for a length of several acres. We also, last autumn, sowed pippins and fruit stones, in order to raise fruit trees. Our plantations have succeeded very well, and we did not lose more than ten trees; the soil is gravelly, mixed with clay and a little sand. 18. Without any doubt. 19. Short, practical treatises, within the capacity of the farmers, would render great service. 20–21. In our township, few people would benefit by the establishment of such an office, and the publication of monthly bulletins amounts to little here. What is required here are cheap implements of husbandry, and prizes in implements of this kind to our farmers, who are poor, but inspired with good intentions to follow the path of progress.

G. LAROCQUE, M.D., *Agriculturist*.

BEAUMONT, BELLECHASSE COUNTY, P.Q.

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1. Too much grain growing is the trouble, and the number of cattle kept is not proportioned to the extent of land under cultivation. We should keep more cattle. 2. Answered below, as to butter and cheese. Cannot say as to the

other matters. 3. Yes; with proper selection. 4. Answered below, in a special treatise. 5. I cannot say. 6. I think so. 7. It is done in other countries with success. 8. I cannot say. 9. I cannot say. 10. I do not know. 11. No. 12. I do not know. 13. It might. 14. The question is of the greatest importance. It is certainly necessary that the Government should take all possible means to prevent the introduction of those contagious diseases, which are now causing great havoc amongst the cattle, sheep and swine in Europe and elsewhere, and combat the diseases existing here. 15, 16 and 17. No answer. 18. It is a matter of absolute necessity. 19. Most certainly. 20. It would be very useful. 21. I cannot say. 22. I think so.

S. M. BARRÈ, *Professor of Dairying, Montreal.*

A SHORT TREATISE ON THE DAIRY INDUSTRY IN CANADA, AND THE MEANS TO BE ADOPTED FOR ITS PROMOTION AND RATIONAL IMPROVEMENT.

T. M. G. A. GIGAULT,
Chairman Committee on Agricultural Industry.

SIR,—Taking it for granted that the chief object of the questions put to me in your circular, is to ascertain my views on the present condition of the dairy industry of this country, and on the means of securing a prompt improvement, I beg to submit, for the consideration of your Committee, the following paper:

I shall consider:—

1. The present importance of the dairy industry, its possible and probable development, and the beneficial effect it is destined to produce on the agriculture of this country.

2. The present state of the dairy industry.

3. The defects of our dairy products; the causes of those defects, and the means I consider most prompt and certain for their removal.

4. The difficulties impeding the sale of our dairy products in competing with like products on foreign markets, and how those difficulties must be overcome.

PRESENT IMPORTANCE OF THE DAIRY INDUSTRY IN CANADA.

The dairy industry is now the most productive industry of the country. It has assumed such proportions within the last few years, that the annual revenue derived by Canada from it, is about eight millions of dollars.

PROBABLE DEVELOPMENT.

In order to form an idea of the probable development of this industry, it is sufficient to reflect that of all our agricultural industries, it is the one which gives the surest, most uniform, and most abundant results, and which, from every point of view (agricultural and commercial) is best suited to all the older Provinces.

Moreover, it is well to know that the demand for dairy products is now very considerable, that it is constantly increasing and almost unlimited, as shown by the following facts:—

England purchases yearly 200,000,000 lbs. of cheese and some 250,000,000 lbs. of butter. During the year ending 30th June, 1883, Canada exported to England 57,672,959 lbs. of cheese and 6,230,173 lbs. of butter. This shows that the export of our dairy products is susceptible of considerable increase.

The consumption and import of these products in England is constantly on the increase, and this is accounted for as follows: The price of meat affects the price and consumption of dairy products. The population of Europe is so great and increases so rapidly that the consumption of meat prevents the animals from increasing in proportion to the increase of the population. It follows from this that the price of

meat will be higher and higher, and as dairy products are the natural substitute for meat, it is evident that the consumption of those products will be greater and greater.

I shall, perhaps, be told that America will furnish meat to Europe, but up to the present time America has furnished a certain quantity to England only, and very soon it will be obliged to supply the whole of Europe.

We have thus at our disposal, both in England and on the continent, a large, constant and steadily increasing market for our dairy produce.

Hence, the possible development of the dairy industry in Canada is practically unlimited.

BENEFICIAL EFFECTS WHICH THE DAIRY INDUSTRY IS CALCULATED TO PRODUCE ON AGRICULTURE.

The dairy industry brings about an increase of stock and, therefore, of the manure at the disposal of the farmer. It enables him to manure his farm better. Now, in order to secure a large quantity of milk it is necessary to have good milch cows and to feed them well, and in order to do this, the farmer must improve his stock and his system of farming, if they be defective.

After a few years the farmer who had hitherto been behind hand, finds himself possessed of a better farm, a fine herd of horn cattle and a considerable income; and all this has come about in such a way that he has hardly noticed the changes which have taken place in his farm, and even in his own habits.

Hence, the dairy industry produces a happy series of causes and effects which go far to solve the great problem of the regeneration of agriculture where that regeneration is needed.

II.

PRESENT CONDITION OF THE DAIRY INDUSTRY IN CANADA.

Cheese Making.

Cheese making is one of the best understood and most productive industries of the country.

The average quality of the cheese of Ontario is superior to that of Quebec. Nevertheless, Quebec produces some cheese quite equal in every respect to the best Ontario cheese, though on the whole there is much room for improvement.

The fact that Ontario has carried off three first prizes at general competitions, against the whole world, at international exhibitions, proves that the art of cheese making is well understood in Ontario.

Notwithstanding that the Maritime Provinces are best favored by nature as regards the facility of exporting dairy products to foreign markets, they are less advanced in this branch of industry.

Exportation of Cheese from Canada.

Year ending 30th June, 1883	57,041,387 lbs.
" " " 1880	26,770,182 "
Increase	30,271,205 lbs.
Export for year 1883, about	60,000,000 lbs.

Butter Industry.

Butter making is much less advanced than that of cheese, in this country.

The cheese industry got the start some fifteen years ago, by the establishment of co-operative or public cheese factories, and it is only of late that attention has been given to the establishment of public creameries.

The principles which govern the making of cheese, were early studied by skilful manufacturers (Mr. Ballantyne and others), and a knowledge of the art rapidly spread. The success which crowned these courageous and deserving efforts, and the high prices of cheese for some years back, have induced farmers (and especially in Ontario) to devote themselves entirely to cheese making, to the exclusion of butter making.

The inefficiency of the apparatus generally used to extract the butter from the milk, the want of necessary knowledge for an intelligent working of this industry, the absence of methods specially adapted to the circumstances of the country, and the poor reputation of our butter on foreign markets, account for the fact that our butter industry can hardly hold its own against the sister industry, cheese making, which seems destined to absorb everything else.

Nevertheless it is highly important to maintain an equilibrium in the production of these articles, for in accordance with sound principles of economy, it is not prudent for a country to devote itself exclusively to one form of production.

Thanks to the initiative of the Local Government, the Province of Quebec has made some progress in the making of butter, and the new undertakings resulting from that initiative, give promise of success. The Province of Quebec is now far more advanced as regards the making of butter than Ontario.

Production.

According to the census of 1881, the production of home-made butter in Canada amounts to 102,000,000 lbs. The production of creamery butter is some 3,000,000 to 4,000,000 lbs.

Export.

During year ending 30th ———	, 1880.....	14,917,053 lb
" "	1883.....	8,106,447 "
Diminution		6,810,606 lbs.

But it appears that the export of the year 1883-4 was slightly greater than that of 1882-3.

Average Prices of Butter in Canada.

Creameries.....	22 cts.
Townships and Morrisburgh.....	19 "
Brockville	18 "
West of Toronto.....	15 to 16 "

We can therefore take 18 cents as the general average price.

Danish butter brings an average price, on the English market, of 30 to 33 cents.

Taking it for granted that we should not obtain so high a price for our butter as the people of Denmark, I think that by improving our process of manufacture, and our means of transport, we might increase the average price of butter by at least 7 cents. It is clear that by increasing the price we shall bring about a considerable increase of production.

III.

DEFECTS IN OUR DAIRY PRODUCTS—CAUSES PRODUCING THOSE DEFECTS—MOST PROMPT AND CERTAIN REMEDIES.

Defects in our Cheese.

The leading defect in our cheese industry in the Province of Quebec, lies in the packing.

Cause.

The boxes used are not suited for the purpose.

The curing of our cheese is defective at the opening and at the end of the dairy season. The same is the case during the great heat of summer.

Causes.

The cheese factories are too slightly built, and incapable of protecting the product against the influences of the atmosphere.

Remedies.

In order to improve the average quality of our cheese, all that is needed is to impart to a certain number of intelligent cheese-men, the knowledge already possessed in Ontario, and then employ them as instructors or as inspectors of cheese factories, wherever the manufacture is defective.

Diffuse, by means of the press, &c., the knowledge requisite for the manufacturing of good cheese, and the establishment of good cheese factories. It would also be necessary to recommend the making and use of good packing boxes.

1.

Defects in our Butter.

Defective butter making by the greater number of our farmers, especially those who have only a small number of cows.

Causes.

The want of knowledge and of the time required for making this product. The ordinary occupations of a farmer's wife are too numerous and too varied, to permit of her giving the requisite care and time to butter making. Labor is at present too high to permit of employing hired help, in such cases, to advantage. For these reasons the making of good butter for export is almost an impossibility on seven-eights of our Canadian farmers.

Remedies.

1. Diffuse general knowledge as to butter making by means of pamphlets, &c.
2. Establish public dairies or creameries.

2.

WANT OF UNIFORMITY IN MANUFACTURE.

Causes.

1. Want of uniformity in the methods followed, and in the principles generally accepted.
2. The butter is made too often by inexperienced persons, who possess neither skill nor taste for this kind of work.

Remedies.

1. The adoption of methods specially suited to the requirements of the country, and the inculcation of one sole theory, scientifically studied and practically tested by intelligent, disinterested men, at an experimental station.
2. The establishment of public dairies or creameries.

3.

WANT OF KEEPING—QUALITY.

Causes.

It is not generally known that two kinds of butter are made, which are considered first quality, but which serve a different purpose. The one has a very marked flavor (as French and American butter) and keeps for a shorter time; the other has a less strongly marked flavor (the Dominion butter, for instance) but keeps longer.

The latter kind is in every respect best suited to Canada; we make butter only during seven months of the year. Then the butter made for the Canadian market must keep as long and even longer than that made for export. For foreign export it is well known that only butter which keeps for a long time can be profitably made.

Remedies.

1. Diffuse a knowledge of the method of making butter which will keep for a long time.
2. There is no better means of diffusing that knowledge than an experimental station.

IV.

DIFFICULTIES TO BE MET WITH IN DISPOSING OF OUR BUTTER WHEN COMPETING WITH SIMILAR PRODUCTS ON FOREIGN MARKETS.

Our farmers keep their butter too long, so that it is too old when it enters into competition with foreign butter on the English market.

The French send their butter to England eight or ten days after it is made. The Germans send theirs within a fortnight. Danish butter is delivered on the English market within three or four weeks after it is made. Our butter has often remained four, five, six and even eight months in the farmers' hands before it is shipped.

It is easy to see that under these circumstances competition is out of the question.

Remedy.

The establishment of creameries.

The establishment of creameries, owing to the quantity of butter made, renders it possible to make weekly shipments, which could not be done when the butter is made only in small quantities by each farmer.

Hence, the article might be shipped from the factory weekly; the duration of the Atlantic voyage is two weeks, and we may allow an interval of another week before the butter is in the hands of the consumer. Thus, there is nothing to prevent our butter from being delivered to the European consumer within four or five weeks after it is made.

If we thus avail ourselves of the scientific and economical means at our disposal, we shall soon be in a position to compete on satisfactory terms with European producers.

CONCLUSION.

From the foregoing, it is easy to see that in order to improve the average quality of our butter, to insure uniformity in production and facilitate immediate shipment to foreign markets, we must establish butter factories.

The establishment of factories is, then, the most powerful lever we can use to improve and develop the butter industry of Canada.

It follows, also, that it is of the utmost importance to diffuse the knowledge required for the establishment of butter factories.

In order to establish butter factories you need skilful and experienced dairymen, and the only way to get them is to form them. They can be formed by establishing dairy schools throughout the country.

In order to teach butter making in the dairy schools, you must have a definite theory of the process, scientifically studied out and practically tested. This can be done only in an experimental dairy station.

The establishment of an experimental dairy station of the kind at present existing in large numbers in Europe, is the first step to be taken.

The theory studied at the experimental station must be taught in the dairy schools, and practised in the butter factories generally, and the latter will diffuse a practical knowledge of butter making amongst the farmers.

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In the last preceding paragraph, we have an outline of the organization of a system of teaching both theoretical and practical, of dairy work, similar to that which is in operation in Denmark, and as regards butter making, Denmark is admittedly in advance of every other country in the world.

We must not lose heart and fancy that a great lapse of time must take place before that system will produce results, for it is not necessary that we should follow in the footsteps of the people of Denmark; we need only take advantage of their experience, and apply their store of knowledge to the special circumstances of our country.

The system of inspection as proposed, aims chiefly at bringing about a reform in the making of our products. As a remedy, I think that inspection would not be effective, for the cause of defective making is the want of knowledge on the part of our farmers, and the peculiar circumstances in which they are placed. Now, inspection will never diffuse knowledge amongst the farmers or provide them with a substitute for labor. Hence, inspection will not have much effect, for the evil is too general as regards butter making.

The whole respectfully submitted,

S. M. BARIE,
Prof. of Dairy Industry, Prov. of Quebec.

OTTAWA, February 26, 1884.

The Committe met, Mr. GIGAULT in the Chair. MR. JOHN LOWE, Secretary to the Department of Agriculture, called and examined.

By the Chairman:

Q. Does the law as it at present stands authorize the establishment of an Agricultural Bureau, and the appointment of a Commissioner of Agriculture?—The Act of 1868 constituting the Department of Agriculture would amply provide for the whole of that. The Act provides that the Minister of Agriculture, for the time being, shall be charged with the execution of laws and Orders in Council and the direction of all public bodies, officers and servants employed in carrying out such laws. The comprehensiveness of that section, therefore, covers every single point of the question. The first function of the Department, in the enumeration of its duties, is agricultural. There has, however, been no special vote for the general purposes of agriculture. There have been special votes for particular branches, for instance, cattle quarantine and inspection, the gathering of statistics in certain particular cases, and also grants to exhibitions. Hitherto this has comprised the whole functions of the Department in relation to agriculture.

Q. What steps have been taken by your Department in order to encourage and develop the agricultural industries of Canada?—I have already partly answered that in relation to cattle. Steps are taken by the Department to prevent the introduction of contagious diseases into the country. In cases where cattle disease has manifested a decided epidemic form, as in Pictou, Nova Scotia, the Department has taken special votes and used special measures for extirpation of such disease. Those measures have certainly been successful, and that disease which did prevail in Pictou, Nova Scotia, and which was threatening to spread to the surrounding counties, has been so promptly dealt with that its absolute extermination will, no doubt, be established by the opening of the spring. But if the extermination is not complete, certainly there will be very little of it. I think there can be no doubt, also, that the operations of the Department in relation to this branch of agriculture—for I suppose we may call stock-raising or keeping, a branch of agriculture, in its relation to the farm—the measures which have been taken and the extreme vigilance with which those measures have been carried out, have preserved this country from all attacks of contagious diseases from the outside, and have done for us what certainly has not been done for the United States, that is to say: they have given us immunity from being placed on the scheduled list in the United Kingdom, the result of

which is that our cattle are now freely exported to the United Kingdon. We can send stock cattle over; they are bought at fair prices and fed in the United Kingdom; the value of that is estimated by exporters at the moderate extent of two cents a pound on the whole gross weight, which is certainly an enormous advantage to the farmers of this country, and under the fostering effects of which the cattle trade has increased within three or four years from almost nothing to its present very large proportions. The cattle quarantine at Quebec, under the immediate superintendence of Mr. Couture, and under the general direction of Mr. McEachran, who is the general inspector, is probably one of the most perfect of its kind on the continent, on the admission of American importers and stock dealers. As a consequence, very large numbers of cattle intended for the United States seek entry to the continent by the St. Lawrence route. We have also a very perfect system of cattle quarantine at Point Edward, near Sarnia, for cattle entering Canada from the United States for breeding purposes—no other cattle than those for breeding purposes being allowed to be imported into Canada from the United States. As a further part of that question I suppose exhibitions may be mentioned. For four or five years past Parliament has voted a sum of $5,000, and last year it voted $10,000, in order to give agricultural exhibitions held in the several Provinces a Dominion character. In so far as the expenditure of that vote was concerned, the operation of the Act of 1868 came into direct effect, as the expenditure was necessarily under the direct responsibility of the Minister of Agriculture. As to the effect of those exhibitions and also the effect of the exhibitions in which the Department has taken part at London, Paris and Philadelphia, it is perhaps unnecessary for me to say anything, but I think it may be fairly claimed that the effects has been to encourage agriculture.

Q. What methods can you suggest for gathering reliable agricultural statistics? —That is rather a wide question, and to answer it in detail would be to present a system. I therefore must give a general answer, and say that of course there are several methods of obtaining agricultural statistics. The most perfect is that which is adopted in the taking of the Census, the employment of sworn enumerators, who have been instructed in their duties, and who go from house to house, and from farm to farm, and take down the information. There are various other devices. For instance, that which is adopted in Ireland is thought to be one of the most perfect. There the returns are obtained by means of the constabulary. The men are under the direction of the Government, and are trained to this special duty. They really get very good statistics. On this continent, however, the information is obtained by circular, or through municipal institutions. The information that can be obtained in that way is always of a most general character and, of course, cannot be exact. I suppose it might be called approximative, but I think even that would be a very strong word to apply to many of the statistics which have been published. Two of the Provinces—the Province of Ontario and the Province of Manitoba—have adopted those systems, and have taken from the practices of the United States those which have been found to be the best. In both of those Provinces those systems, I think, are very fairly and very carefully carried out, and there is certainly a mass of information obtained. I should say further, with respect to the Province of Manitoba and the North West Territories, that the Government took a special vote from Parliament for the purpose of gathering statistics there, as the information was thought to be of such vast importance to the Dominion. In carrying out that, the Minister of Agriculture made an arrangement with the Department of Agriculture of the Province of Manitoba, that for a moderate subvention they should place their machinery at our disposal and *coad* these particular statistics. Their officers did report direct to our Department. The result was the gathering of a very considerable mass of figures, which appears to stand a fair test, and I think may be called approximate. The tabulation of these figures is now about finally completed in the Department of Agriculture, and I think will be published during the present Session. The Committee, of course, will see the kind of information that can be gathered in that way. Perhaps that is the only kind of information that could be at present obtained, as I feel very doubtful if Parliament would be willing to make a vote sufficient to obtain a direct enumeration.

Q. Do you believe an arrangement similar to that made with Manitoba, could be made with the other Provincial Governments?—There would be no difficulty in the way of doing it, but it would require, of course, the friendly co-operation of the Governments of the Provinces with which the arrangement was made.

Q. Do you think those statistics could be gathered with the aid of the municipalities?—I have already mentioned that as one of the modes of obtaining statistics. You see that system applied in Ontario. You will get approximative results, and many particulars from those results.

By Mr. Orton:

Q. You were referring to cattle diseases just now; was there any report from England in relation to our cattle being scheduled this last year?—Not that, Sir; but during the summer there seemed to be an attempt to fasten a contagious disease on two cargoes of cattle, by the "Oregon" and "Nepigon," I think. Our officers in England did not believe there was such a contageous disease among the cattle although the cattle were condemned for slaughter on the ground that it prevailed. Mr. Dyke, the agent of the Department at Liverpool, immediately communicated the facts to Sir Charles Tupper, in London. Sir Charles went to the Privy Council, and from the Veterinary Department of the Privy Council got an order, enabling him to make a full investigation. When he arrived in Liverpool, he was told that all was settled, that the cattle were ordered for slaughter, that the disease was there, and that there was no need to make any further investigation. Sir Charles said "Well, I am not satisfied with that, I desire to have three or four cattle selected from these cargoes, and slaughtered, in order that we may have definite proof." That was blankly refused by the officer in charge. At that point, Sir Charles produced the order which he had brought from the Veterinary Department, and made himself known. Of course then, he was enabled to enforce immediate compliance with his orders. The result was, that cattle selected as being most likely to have the disease, were slaughtered. They were found to have no disease, and the fact was reported to the Privy Council. The order which had been given on the supposition that the disease was there, was rescinded, and so we escaped being scheduled.

Q. Was there any trouble about sheep?—There have been several cargoes of sheep on which the scab has been found—Canadian sheep—but that happened in this way: our veterinary inspector has refused to allow sheep to be placed on board the steamers on account of the disease, but there has been nothing to prevent those sheep being taken to the United States. They have been taken to Portland, sent to England, and on arriving in England have been slaughtered, certainly under the name of Canadian sheep, but still as coming from a United States port. The Department, of course, has taken the necessary steps to have that position very clearly defined and established. No later than last week there was a case of that kind.

By Mr. Fisher:

Q. Is there a report of sheep disease in the Province of Quebec?—Yes; Mr. McEacharn, the veterinary inspector, has sent several reports to the Department recently on that subject, and on those reports orders were given to have the necessary steps taken for its extermination. Those steps are now being taken. The disease seems to be confined to the County of Laprairie and contiguous counties.

Q. I did not know whether it had been stamped out or not?—No; the most active measures are being taken in the matter.

By Mr. Massue:

Q. What is the present law regarding the shipment of sheep to England?—There is no impediment to the shipment of sheep from Canada to England. The only restriction is the inspection by Mr. McEachran or some of his officers; sheep found by them to be diseased are not allowed to embark.

By the Chairman:

Q. That inspection would take place at the point of embarkation?—Yes, at Montreal or Quebec.

By Mr. Orton:

Q. I suppose upon their arrival in England they are inspected?—Yes; they are immediately met by officers of the Veterinary Department of the Privy Council

there, and nothing can be more strict or keen than the scrutiny to which all animals are subjected on their arrival. In the case to which I referred a short time ago, there was manifest unfairness, if not design, to place the cattle of Canada in an inferior position last summer.

By Mr. Fisher:

Q. You spoke, a few minutes ago, of the importation of breeding cattle from the United States; do they all have to go into quarantine?—Yes; I might perhaps explain that that is an exception to the general order of prohibition, which prevents the importation of cattle from a scheduled country; that is, a country in which contagious diseases, and particularly such diseases as pleuro pneumonia and foot and mouth disease, exist. That prohibition is the single condition on which we obtain immunity from being placed on the scheduled list in England. But by special consent, an exception was made with respect to cattle for breeding purposes only, at one western port; only one western port was allowed, and Sarnia was selected, on account of the very favorable conditions which are found at that point, for the establishment of such a quarantine.

Q. Then, you mean to say that breeding cattle cannot be imported at all from the United States except through Sarnia?—Not at all. The Government cannot order the importation of a single animal at any point but Sarnia, except at the cost of placing Canada on the scheduled list in England, which, of course, is not to be thought of.

By Mr. Orton:

Q. Have you any account of the number of cargoes of sheep scheduled last year?—I think we have it in the Department. We have not made it a very special point of compilation, but they have been quite numerous—that is to say, sheep which have not been allowed to be embarked on steamers have been, by their owners, taken to the United States, which we are powerless to prevent, and from the United States ports they have been shipped to England.

Q. And they were slaughtered on their arrival?—Yes; the misfortune being that they have been called Canadian sheep; but the veterinery authorities in England have been made very fully aware of the circumstances which I have stated.

By Mr. Fisher:

How many cargoes of sheep from Canadian ports have been stopped on their arrival in England?—I cannot recall one at this moment. There has been no serious danger in that respect.

By the Chairman:

What conclusions have you arrived at from your visits to, or investigations of, experimental farms, and so forth, in other countries?—The Department has never made any official visits of that kind; there is, therefore, no information which I can give on that subject. I have myself visited some of these model farms, but not in such a way as to furnish information to the Committee.

Q. Does your veterinary inspector publish reports every year?—The annual report which is published is that of the Minister of Agriculture, which is laid before Parliament every year. It generally contains a reference to the subject and notices special points or facts which had occurred during the year.

Q. In the United States the veterinary publishes a report and says in it what remedies have been employed for different contagious diseases; do you not think it would be well to do that here?—The reports which have been published by our veterinary inspector for three or four years past, have been of an exceedingly elaborate character. They have referred to the diseases which have prevailed and the methods taken or to be taken for their cure.

By Mr. Fisher:

Q. Can you give us any idea as to what portion of the expenses entailed by the Department has been laid out upon purely agricultural subjects, and not connected with the Census—immigration and colonization, or subjects of that kind?—Well, in the expenditure of the Department we are strictly, I may say alsmost sternly, guided by the definition of our votes. We are not able to spend money voted for one purpose,

for any other purpose, and if we should happen to over-run our appropriation on any one point, of course the Auditor hauls us up for it, and we have to get a Governor General's Warrant. There has been no general vote for purely agricultural purposes, nothing beyond the special votes to which I, in the first place, referred.

By the Chairman:

Q. Would the establishment of a Central Bureau, having for its object the collection of information on all matters relating to agriculture, and having a skilled staff, capable of giving advice, making experiments and noting the improvements effected in other countries that might be advantageously introduced into the Dominion, be a benefit to our agriculturists?—Of course, if such an organization were efficient, it could not fail to be a benefit. There arises, however, this question: if the Provinces, by their present systems, gather agricultural statistics, whether we can by their methods make any improvements upon them. Of course there is the further question of skilled direction from the centre; that is one of very great importance, and if the necessary expenditure were made and the necessary direction given, there could not fail to be advantage from it.

Q. Don't you think that the appointment of a Commissioner of Agriculture here is advisable?—I do not know whether I, as an officer of the Department, should answer that question, or whether you had not better get that information from outside sources. I think my previous answer has really covered that. If you had a very intelligent and skilled direction from the centre, you might have an advantage if there were an affiliation, an arrangement of affiliation, with the Provinces. Such a direction, which is provided for by the terms of the Act of 1868, to which I have referred, might homologate, digest and classify into a whole, the parts which the Provinces get together; now, for instance, that little arrangement we have with Manitoba at the present time, is comparatively inexpensive, and promises to be fairly effective. I think the statistics obtained in that way are as approximately correct as any statistics obtained in that manner can be. Of course the system is faulty in the particular that you have not direct control over the emunerators, who are the initial parties to gather the information, on the correctness of which all must depend. So far as compilation is concerned, the Department of Agriculture would be in a very good position to put that into effect. So far as the monthly publications are concerned, in one of the questions which you first put to me, of course their value would entirely depend upon the accuracy of the information given.

Q. Are you not under the impression that the system followed at Washington has been productive of good?—I think there is no question about that. I do not think that accuracy has always marked the Washington publications, but I am sure that many of the experiments which they have tried have been very useful and have led to good results.

Q. Would the establishment of an experimental farm, or garden, where varieties of foreign grain, fruits, trees and fertilizers might be tested, and whence such seeds, plants, &c., might be distributed throughout the Dominion, be advisable?—Of course, every fact useful to agriculture that might be demonstrated by an experimental farm could not fail to be of use. In the Province of Manitoba, at this present moment, there are many important questions still in doubt, which might be determined were such farm or nursery undertaken by the Government, or by private enterprise. There is certainly very much uncertainty at present with reference to the growth of many kinds of trees in the Province of Manitoba, and in parts of Manitoba; and also with reference to what may be the success on the prairies of the growth of fruit trees of certain kinds, especially the apple.

By Mr. Orton:

Q. I think the Government have under consideration the idea of establishing a nursery in the North-West?—That I cannot say; but I believe there have been some applications by private persons for subventions to assist in carrying out experiments in regard to the growth both of shade trees and fruit trees.

Q. Do you not think it would be a very desirable thing for the Government to establish some such nursery in the North-West?—As to the absolute desirability of

having that experiment properly tried, in the abstract there can be no question. As to the policy of undertaking it, or the expense of undertaking it, or the means available for undertaking it, those are practical questions of great importance, and not free from some difficulties. They have, of course, to be determined by the Government and Parliament between them.

Q. Do you think the end would be better arrived at by the Government establishing a nursery, or by private enterprise assisted by subsidies?—I should not like to say that. Possibly the cheapest mode would be to give a moderate subvention to a private enterprise for a few years, to try the experiment. I have no doubt that the absolutely cheapest mode would be that. But whether that would in all respects be sufficiently effective, or give sufficient control, is another question. Then there is also the question of the Government making arrangements with individuals. It must be remembered that what they do for one they may be expected to do for another, and when you have a precedent set it is very easy to build on that foundation. I do not see any difficulty whatever as to the question of the desirability of obtaining the end. The points of difficulty which I point out have reference to the practical difficulties of obtaining that end. The difficulties of administration are quite serious, and they present themselves in a very serious form to the Minister of Agriculture, though they do not always appear to be quite so clear to those who desire to have the scheme carried into effect. That is rather a Departmental view of the case.

By the Chairman:

Q. Would it be desirable to extend the duties of the present system of veterinary inspection of stock in quarantine, and if needful, the staff also, with a view to deal with the local development of infectious diseases among farm stock and poultry throughout the Dominion, and the best means of stamping them out?—I think you will find that the Department of Agriculture, with its present vote for cattle quarantine and public health, and its present staff under Mr. McEachran, of Montreal, and Mr. Andrew Smith, of Toronto, will watch all points of that kind with untiring vigilance; and certainly if ever greater emergency should arise than does arise at present, there would be no hesitation whatever in taking the necessary steps to deal with it. Even if the vote should be exceeded, and it should be necessary to ask for an indemnity, nothing can be more acute than the apprehension of the Department as to the necessity of taking steps to carry out all that arrangement.

Q. Would the appointment of an entomologist, whose duty it would be to give information concerning birds and insects injurious and beneficial, and the means of protecting the crops against their ravages, accomplish any benefit to the farming classes?—Of course, the answer to that question is precisely similar to that which I gave to a previous question, as to the experimental farm. There can be no doubt as to the very great advisability, the very great value of that kind of information. The mode of doing it, the expense of doing it, the machinery by which it is done, are practical questions of administration, which would probably form a part of the first one if it were put into effect. I think they are simply a branch of it.

Q. Would the dissemination of handbooks and reports on agriculture, on matters relating to stock-raising, dairying, poultry-keeping &c., have a beneficial effect?—There could be no doubt of that, if the matter distributed were valuable. The Department has from time to time, not directly officially, but semi-officially, made enquiries and published the result. For instance, when the potato beetle threatened Lower Canada, the officers of the Department made some very particular enquiries respecting that insect; and Dr. Taché published a little *brochure* on the subject at his own expense, and it was circulated, and some copies of it were bought by the Department for the purpose of farther distribution. But there has been no vote for any systematic publication of that kind. Of course, the mere publishing of a pamphlet is not very much, but when you come to publish pamphlets for general distribution, you very soon run up into very large sums of money.

Q. Would the appointment of a public analyist, to whom samples of soil, and of home manufactured and imported fertilizers might be submitted, prove of advantage to our farmers?—There can be no question of the advantage of that either, if it can

be done. We have obtained certain analysis of soil in England, in Scotland, and in Germany, especially of the soil of Manitoba, which have been found to be very useful. There was one particularly, by Sir John B. Lawes, which was made last year, of some specimens of Manitoba soil submitted to him, which he found to be exceedingly rich in nitrogens.

By Mr. Fisher:

Q. From your replies to these questions, it seems there is no doubt of the feasibility of all the proposals, and it is a mere question whether the return to the country from the establishment of such arrangements would compensate us for the expenditure they would involve?—I think it is rather a question as to whether the country is prepared to go into that thoroughness of organization which would lead to satisfactory results. That is the view which strikes me as a departmental question. Of course, carefulness and accuracy are the great points to be obtained. I think, as to the question of desirability, that if we can get the results, there is, on that point, no question.

Q. From your answers appertaining to inspection of stock and quarantine, they seem to be quite sufficient at present, and that the chief advantage which would accrue to us would be from a new departure in the way of an Entomological Department?—Yes; and the testing of grains, and the testing of trees, and the adapting of fruit trees to the North-West. I think these are questions of almost immediate importance.

Q. Q. Is not the Manitoba Government doing something in regard to that?—There is nothing being done; and the farmers are too busy to do it. I think these are questions of vast magnitude to the North-West, especially in view of the very large expenditures which are taking place there, the very large numbers of people who are going in, and the still larger numbers that might be attracted to that almost illimitable territory. There is one fact which I may state further, and that is that the expenditure Parliament has hitherto made, with reference to carrying on those operations in regard to stock and its care, have been of unspeakable value to the Dominion. I think that the question of cost is almost nothing. It is not a cent in the balance as compared with the results obtained.

By the Chairman:

Q. What is the amount generally voted for that purpose?—It is about $20,000 a year; that is, the amount generally voted for quarantine.

Q. I see that in Washington they spend about $200,000 a year for a Central Bureau of Agriculture?—Yes.

Q. And in that sum of money is included about $75,000 for the distribution of seeds from foreign countries?—Yes; and undoubtedly very good results have arisen in many cases from those seeds. There have, however, been complaints that a great deal of the seed has been wasted; that is, that it has not always fallen into the right hands. That kind of difficulty has appeared, judging by the newspaper reports, with regard to the Washington system. I do not give that as evidence, but as mere report. Certainly if any steps in relation to the question might be believed to be as beneficial as have been the steps in regard to stock, you would have one encouragement to go on.

Q. I see that one of the objects of the Royal Society of England is to correspond with agricultural and horticultural societies and practical farmers, and to secure any information that might be beneficial to farmers and to publish it. Do not you think a Bureau of Agriculture here to do the same thing—and I think the Bureau of Agriculture in Washington is doing there what the Royal Agricultural Society in England is doing—would be beneficial?—That undoubtedly might be done, but probably you would have great difficulty in instituting such experiments as those which are now being carried on by Sir J. B. Lawes, in England, as a private enterprise. I think probably you would not be able to get anything of that kind. As to whether a Bureau established by the Government could, in all respects and with the same advantages, carry out these experiments, is also a matter of doubt.

By Mr. Fisher:

Q. Is not the Royal Society of Agriculture in England almost entirely sustained by private enterprise?—I cannot say whether it gets a subvention from Parliament or not, but it is undoubtedly simply a private enterprise.

By the Chairman:

Q. Do you think we have individuals wealthy enough here to do what the Royal Agricultural Society in England is doing?—No, Sir.

Q. And if individuals here cannot do what the Royal Agricultural Society in England is doing, do you not think the Government should undertake the work?—I certainly do not think the condition of affairs in England can be applied to Canada in this respect.

By Mr. Fisher:

Q. Then there is this: The individuals who do that kind of work in England are enthusiasts, and they really devote more care and attention to it than would paid officials of the Government here?—Yes; they are specialists. Now, if it came to the question of carrying out experiments of the kind referred to here, it is not by any means certain that a man like Sir J. B. Lawes would get the situation. That is one question, and I think they have found some difficulties of that kind at Washington too.

By the Chairman:

Q. According to a letter sent here by the Commissioner of Agriculture in Washington, he says there have been very good results from the work of the Bureau of Agriculture there?—I do not think there can be any sort of a question about that. They have garnered a great deal of grain, but I think they have also got with it a little chaff. Still there is no reason why you should not get the grain, if good results. They have in the United States to contend with those two great cattle diseases, and unless they can effect their entire extermination, they never can get off the scheduled list in England. That is a constant, steady embargo upon their trade, and I do say that that extermination, if it can be effected at all, will require a very great effort on the part of the Central Government and the concurrent effort of State Governments, and the cost will be millions. The damage also is millions. There is a movement, and there have been movements to effect that.

Q. According to the report of the Agricultural Commission of Ontario, the farmers lose a million dollars a year on account of the inferior quality of the butter shipped to England?—I dare say that is a fact.

Q. I see that the Ontario Government has distributed handbooks on scientific butter making; do you not think such a book published by a Bureau of Agriculture here would be beneficial to the other Provinces?—There is not the slightest doubt of that.

Q. That is, if it were published under the control of a very skilful agriculturist?—There is one fact in regard to Canadian butter going to England that is of importance. In the Eastern Townships, from which Mr. Fisher comes, the people have very good facilities for making butter of the very best kind, and there are many skilled butter-makers there applying scientific methods. There butter is bought by buyers from Boston at their doors. It is sent off to Boston, where it is marked New England dairy, while the culls, or inferior butter, are marked Canadian.

By Mr. Fisher:

Q. That is changing now?—Yes it is, but it has been going on to my knowledge.

By Mr. Orton:

Q. Do you think the herbage in Manitoba and the North West is peculiarly adapted to dairying?—Generally; the plains can scarcely be said to be peculiarly adapted to that, although there would not be the slightest difficulty in many parts from the richness of the grasses and the facilities with which water can be obtained. I think that in the spurs of the Rocky Mountains the conditions exist in the highest degree.

Q. It is generally thought by those who use butter made in Manitoba that the flavor and the aroma are better than those of the butter of the other Provinces. You

are aware that there are many wild flowers on the prairies, and these give a peculiarly rich aroma to the butter ?—Of course you can make the very best of butter there, but to say that that is a better butter than is made in the other Provinces would be too much. I think that in the spurs of the Rocky Mountains, where the clear, blue streams run down, there is a rich herbage found, which will give you better butter than on the plains.

The Committee adjourned.

OTTAWA, 29th Feb., 1884.

The Committee met, W. GIGAULT in the Chair. Mr. CHAS. GIBB, of Abbotsford, County of Rouville, P. Q., called and examined.

By the Chairman:

Q. I understand you are engaged in agricultural pursuits ?—Yes.

Q. You have a farm and carry on farming operations ?—Yes.

Q. What experience have you in horticulture ?—That question is a very broad one. The lines in horticulture to which I have given the most attention are fruit, forest and ornamental trees.

Q. Do you belong to any horticultural society ?—Yes; to several of them.

Q. Have you visited the North-West ?—I have been in the North-West.

Q. Is tree-planting practicable there ?—The North-West is a large country. There is not only a variety of atmosphere there but a great variety as to dryness or moisture. The chief obstacles to tree-planting on the prairies, in Manitoba, for instance, are the cold winters; and in places, the impenetrable clay underneath the thin coating of black loam. You come to totally different difficulties when you get into the Medicine Hat region, where you are on the edge of a cold, dry desert, and there you need trees adapted to cold, dry regions.

Q. Do you believe that tree-planting is possible there ?—In Manitoba I never expect to see the same growth of trees that we have in Quebec—that is, trees of the same size for timber uses, but I do not see why there should not be timber grown there for fuel, for shelter and for various other purposes.

Q. Do you think the Government could aid tree-planting in the North-West ?—Certainly; and it is absolutely necessary that there should be wind breaks, shelter breaks and fuel there at the earliest possible date.

Q. And to help tree-planting in the North-West, what would you suggest ?—The only way in which that can be done, and done rapidly, is by starting testing grounds, where trees of easy culture can be grown, propagated and scattered. I see no other way.

By Mr. Fisher:

Q. When you say testing grounds, I suppose you mean in conjunction with propagating nurseries ?—Now, for instance, in Manitoba I have often been asked: "What ought I to plant as a wind-break tree." I said: "The white willow." Then came the question: "Where are we to get it." Well, the chances are that the only way to get it is by sending for little cuttings, which come by mail from Minnesota. Now, what we want to do is to carry into that country any quantity of such trees as the white willow, the white silver poplar of Europe, and other trees of that character, which grow rapidly from cuttings. Besides that, we want to go into a series of experiments. We want to know whether the white ash will grow in that country. We want to know also whether the Norway maple will grow there; and the best thing to do is to introduce such trees as are rapid growers and experiment with them.

Q. That would provide quick-growing wind-breaks, which you would get in a very short time; and then I suppose other trees would do for places where rapid growth is not so immediately necessary, or to take the place of the white willow and quick-growing trees, if not found to be so good ?—In the North-West the great point is to have trees for shelter and fuel at the earliest possible date. Therefore, we must begin with the white willow, the cotton wood, and the silver poplar of Europe. Then let us start plantations of such trees as ash, Norway spruce and trees of that kind, to

come in after the others. But the first question is trees that grow quickly from cuttings.

By the Chairman :

Q. You have visited Germany, Russia and some other European countries; is arboriculture successful there?—Yes; Europe looks upon forestry from a different point of view to that at which we look at it in this country. From the large amount of pine that has been planted all through Germany and the careful—not the wasteful—way in which the people use it, pine must before long become an article of export from that country. Then on the immense sand plains of Poland, land fit for nothing, there are immense plantations of pine. To the forests of Germany you may almost apply the term "high culture," or garden culture, because the Government forest shows care in its management, which contrasts strongly with the negligent care of the peasant's lands. When you come into Russia you see the same care in the Government forests. I forget exactly how many Government stations there are, but I think there are some two hundred of them, and as you wander about Russia you continually come across them. There are large plantations of trees, and if there are any woods adjoining them those woods are carefully kept.

Q. What methods have been adopted by the Governments of Germany and Russia towards making arboriculture successful?—The principle that seems to be adopted by these countries is that when land is suited only for the growth of trees the Governments—I do not know whether they buy them—take means to provide that the forest shall produce all it can per acre. That is the idea of the Governments of Europe on that question.

Q. Have you examined into the cultivation of fruit trees in foreign countries?—Yes; we have our drawbacks in the way of fruit culture in the greater part of Canada. We are north of the limits of the successful culture of the fruits of western Europe; and it is only those occasional fruits which have, for some reason or other, some northern blood in them, some northern ancestry, that can be grown in our colder climate. So that we are compelled to go to the old world, and to the cold climates of that world, for our fruits. In this country, besides, we have no native fruits, except the little wild sweet-scented grape, in the North-West, which is not eatable. We have no pear, no plum, and no cherry, except the little black cherry and the choke cherry. We have to go to the old world for our fruits. But the greater part of Canada is north of the limit of the successful growth of those fruits. But, fortunately for us, there is another race of fruits growing in the colder parts of the old world which suit our climate. A year ago, I spent about two months in England, Germany and Russia. We went to the Botanic Gardens and other places of interest to us. The Russians have looked up their forestry and botany, but their fruits they have not looked up. That threw us into the peasants' orchards. We had to wander about among them, and we were in the coldest gardens in the world at the time the fruit was on the trees. We got a pretty good idea of the Russian fruits, though we found nobody in Russia who knew them well. The fact that we found the fruit there brings out the further fact that there are races of fruits, by the introduction of which we can increase the area, North-west, of the apple, pear, plum and cherry on this continent, and that very materially. If you look into my report you will find a table of climates, made out by the Meteorological Office at London. There are some errors in the column headed: "Lowest temperature in last six years." Through that report you will also find the record, as given by the Government, and as given to me by the western stations all through Russia, of the lowest temperature recorded.

Q. Do you think there are more varieties of fruits in Russia than here, and that we can increase our variety by importing fruits from Russia?—They are growing the apple there in great quantities. Now, for instance, take the Government of Kazan, 400 miles east of Moscow, 600 miles further north than this, with the extremes in the matter of climate, a warm summer and dry, steady winter. It is a point to which Crookston, or Fergus Falls, on this continent, would correspond. There we find the apple grown in twelve peasant villages to the value of about $50,000 per annum. The thermometer had been down to forty degrees below zero the winter

before we went there, yet the trees were full of apples. The thermometer had been down to fifty-two or fifty-six five years before, and there were no signs of winter killing on those trees. Now, the fruits of that region must be of great value to parts of our North-West. I do not want to be too sanguine about the North-West. I hope we can grow fruit there; but we are going to fail in some of our first attempts, because we do not know how to grow it there. As I say, those fruits that are growing in climates so much colder than our own ought to be introduced there. Then, as regards the pear: I saw pear trees at Saratof, where the winter temperature is one degree milder than at Quebec, and they were in good health. Then, when you come to the cherry: in the district of Vladimer, just east of Moscow and a little north of it, where the winter temperature is three degrees lower than it is at Quebec, they grow a cherry in such quantities that full cars of it and, at times, entire trains of it are shipped; at all events, it floods all the markets, and yet the winter temperature of the climate in which it grows is much lower than that of Quebec. That brings up the query whether such fruit should not be introduced into Canada, not for limited trial, but for something more than limited trial; because if we had it, it would lead to another industry, that of canning the fruit, which would be well worth having. There are plums grown in these regions of the German prune type, of good quality. At the same time, whether they or an improved variety of the wild plum of the North-West will be the plum of the future for us, is a question. There are still other fruits grown there that we can grow; for instance, take the mulberry. There is a Russian mulberry that has been introduced into this climate already; it is possibly of some use, but do not let us take all that is said of it for granted. At any rate, there are mulberries in Mongolia, Central Asia, growing in colder regions than those in which the Russian mulberry is found. There are also mulberries of fine quality growing in Amur, on the Pacific Coast, so that we should increase the area of growth of that fruit. Then we come to the apricot. The apricot is growing on the Altai Mountains, between Turkestan and Southern Siberia, at a high elevation and in a cold climate. They are only medium in size, but of good quality. They are growing on the edge of the desert. When it comes to peaches, I do not know of any peach that can be grown in a climate like that of Montreal. We can, by the introduction of the Chinese peach, get varities that will grow to a certain extent north of the point in Canada at which they grow now, but not in the cold Lower Canadian climate. Still, judging by the Russian fruits we have seen and tested, we know we can, in the climate we have, increase the area northward of the fruit culture on this continent.

By Mr. Foster:

Q. You have spoken in regard to temperature; is there a similarity of conditions in Canada and Russia as to winds?—Russia is a huge continent and a flat continent. St. Petersburgh has a Gaspé climate; Moscow a little more of an interior climate; Kazan a Steppe climate. I do not think the winds at Kazan are as high as at Winnipeg; but they have a rainfall at Kazan less than half that of Montreal. It is a dry climate; but it has not the winds of the North-West.

By Mr. Fisher:

Q. How does the rainfall at Kazan compare with the North-West rainfall?—I could not tell you the Medicine Hat rainfall just now.

By Mr. Foster:

Q. What is the quality of the Russian apples you have spoken of?—They vary a great deal in quality, but there are very few sour in them. The Russian does not like sour apples, and I suppose sugar is a little dear to buy. There are no apples that beat the Fameuse, but there are some of really good quality.

Q. They make a serviceable and useful fruit?—Certainly.

By Mr. Fisher:

Q. Will they average as high as the fruits we grow here now, as far as quality is concerned?—If you except the Fameuse and the St. Lawrence, there are no market apples in Lower Canada that are of first quality; and if you take out the Spitzenberg and the Gravenstein, there are no apples grown in Ontario for market purposes of

first quality. You must remember that the great market fruits of the world are never the fruits of the highest quality.

Q. Do you think the Russian fruit would average as well as our Canadian fruit?—Certainly.

By Mr. Foster:

Q. What do they do with the mulberry?—I was not in the mulberry growing districts. The Russian mulberry that grows in this country is not the fruit of that name that grows in the far north. It is a big tree at Odessa, and the Mennonites, who brought it out, brought it from the Sea of Azof, on the Black Sea. We did not go into that climate; we kept in the cold climate.

By the Chairman:

Q. Is fruit culture lucrative in Canada?—My own orchard is a young one. If I answer that question, then I must give the opinion of other people rather than my own. I have a neighbor, Mr. Cotton Fish. We got him to make an estimate of what his orchard had cost him, and an estimate of the amount he had received in cash from it last year. He began by saying that the great mistake he had made in his orchard was that he began before the time when we were looking into kinds for profit. He therefore transferred all he could not sell in his nursery to his orchard, and he got an awful mixture. Some of his trees were productive and some were not. Then he planted on land that was stony and worth not more than $20 an acre. In that way his investment per acre was small; the amount of capital invested was small, but his estimate was that he had averaged for a certain number of years 75 per cent. on his investment.

Q. Counting the labor?—I suppose so. I forget his exact figures, but they were put on record in the Montreal Horticultural Society's report, a few years ago.

By Mr. Fisher:

Q. I think that was the net profit?—Yes.

Q. I think it would be fair to say that his investment was unusually small, and that as he used trees he could not otherwise dispose of, the circumstances were usually favorable to him?—Oh, yes; he planted a good deal of absolute rubbish that produced very little; but inasmuch as he took his own trees out of his own nursery and put them in there, he secured a return of 75 per cent. on his investment.

By the Chairman:

Q. How does our cultivation of fruit compare with that of foreign countries?—I think our average culture is fully up to that of other countries. We get hold of books by Battel and others, and we find the most marvellous artistic work in grafting, and we think from that, that that is the general state of present culture, but it is far from the case. You find the most slovenly culture, both in Germany and in France. I think our culture, though it is far from what it should be, is well up to the average of European culture.

By Mr. Fisher:

Q. I supposed if you were to compare it with the culture of the Government stations in Germany and in France, it would be inferior?—The Government stations are beautifully kept in some places. All through Wurtemburg, to the Government forests, the words "garden culture" or "high culture" would apply with the greatest truth.

By Mr. Foster:

Q. Do the Governments go in for fruit culture?—Except at their experimental stations, where they test very largely the fruit for their localities.

By the Chairman:

Q. Do you believe that these experimental stations help to increase the production of fruit or to improve the quality?—They have been almost the only means of doing anything of that kind in those countries. The average peasant in Europe does not see as much as we do. He has not any wide ideas outside of his own immediate neighborhood, and unless he has some advantage near at hand, in the form of a Government station, he has nothing to learn from. It may be that his forefathers have

grown a certain apple; for that reason, and for that alone, he continues to grow it; and the botanic garden is the only teacher he has.

By Mr. Fisher:

Q. In continental nations people look more to the Government than to private enterprise for instruction, do they not?—I said the Government stations were the only advantage the peasants have. I should add that they have innumerable little branches in this way. In Germany there is a law requiring all the district school teachers to attend one of the entomological schools, and to spend three days there at a certain period each year. They hear lectures and take up certain kinds of work. When they go back to their schools they have a certain piece of ground which they keep, and by its aid they give instruction to the students in horticulture. That is the way in which Germany has kept the idea of horticulture and fruit culture before the people.

By the Chairman:

Q. Did you see a great many of those botanic gardens?—As we went through Europe we took in all the botanic gardens we could in climates not too mild. We went to the forest school at Nancy, to the entomological school of Dr. Lucas, at Wurtemburg. We went through Northern Austria and Northern Germany. These botanic gardens vary very much in the character of the work they do. Some remind me of a geological museum. In a geological museum we find specimens of all the rocks, from the Laurentian to the recent. In some of these botanic gardens we find specimens of every known tree; and these trees are placed there in order to see whether they will stand the climate or not. Then, again, some of these stations have gone beyond that. They go in for experiments with all sorts of forest trees and ornamental trees, and for the propagation and scattering of those that will live in that climate.

Q. Do you think they have good results?—They are based on this fact, that in any given country we find a very small porportion of the plant life that will grow in that country. For instance, here we have no native tree fruits except our choke cherries and our wild plums; but we find that we can grow all sorts of fruits from similar regions in the old world. You take any given part of this world and you find that only a small amount of the products grows on it. But by bringing from all other similar climates in the world the fruits that grow in those similar climates we can increase the fruits of the climate ten times over.

Q. Do you find botanic gardens in every British colony?—There is one curious point when you come to think of that. If you take up the reports of the botanic gardens you will find that they have large botanic gardens, stocked with every kind of plant that can be produced in the tropical climates, in all the British colonies. Let me speak a little more particularly on that point. If you go to Europe you find that every European Government has spent large sums in the establishment of botanic gardens. When you go to the Tropics you find that the different Australian colonies, Melbourne, Brisbane, Adelaide, all have their botanic gardens. New Zealand has three or four; Tasmania has two; Mauritius has one. At the Cape there are two. In India there are a lot of them, with one central station at Saharranapore. In the West Indies they have three specially large stations, one in Jamaica, one at Demarara and one at Trinidad, with other smaller stations. The East and West Indies have been interchanging their products for over a hundred years. I would like to take as one sample the Island of Jamaica. Their botanic gardens were started a hundred years ago by the capture of a prize ship from the East Indies going to some other colonies. This vessel contained various plants. These plants were planted out. In time the number of stations increased, and now there are eight of them. The island is 150 or 180 miles long. It has a low-lying, but rising sea shore, where they grow all kinds of cocoanuts. Then when you get up the mountains, you find different products. There you find in the different climates grades of oranges, coffees, cocoas and the chincona from which you get quinine. The result is that numbers of fruits are grown there, and now steamers are going to all the different ports around Jamaica picking up a cargo almost anywhere

and carrying it off to New York. Such has been the effect of the experimental station on the fruit trade of the tropics. Now, take the chincona, that is the quinine, the first they had could be grown between the fourth and fifth, but now they have another, which instead of selling at 2s. 6d. sells at 7s. 6d. per lb. Then they have some which will grow down two thousand feet lower on the mountains. Then there is the coffee area; that is limited. But they introduced the Liberian coffee, which will grow nearer the sea shore. They have also introduced other things, and the curious thing about the fruit trade of that island is, that hardly any of it is a trade in any kind of native product. If we get into a country trees specially adapted to it, they will grow with very little care, and so it will be with this apple question, though if you introduce an apple, it may want at first a little nursing. The work of the most value to us here in Canada—except in the milder portions of Ontario—is the work being carried on at the State Agricultural College at Ames, Iowa. The work that is being done there is simply this. Varieties are imported by that experimental station. As they are imported they are propagated and sold at a small rate, to those who specially want them and are likely to take care of them. Then the place is run as a nursery in another way. All you want to do is to get those things that are not in the market, and to scatter them at a reasonable rate, which tends towards starting them; the moment these things are grown in the country and can be got elsewhere they drop them. But the idea is to scatter them. That is the kind of work that I would like to see done here at Ottawa, or some central point.

By the Chairman:

Q. How could the Government bring about a better system of cultivation of fruit trees?—I do not consider that our great lack in the greater part of Canada is lack of culture; it is more a lack of varieties that we can grow in our cold regions, or in unfavorable localities in the wild regions. Now, for instance, we in Montreal are on the extreme northern limit of the growth of Fameuse. If you go to Newport, on Lake Memphramagog, you will come to a climate colder than that of Montreal, that cannot grow the Fameuse, though we can grow them at Montreal; it is only the temperate parts that can grow it. Now, what we want to do is to supply the localities that cannot grow it with trees they can grow.

Q. What plan would you suggest to secure that? Do you think the Government should establish an experimental station or an experimental garden?—Suppose we had something of that kind started here, we would not need more than ten acres of ground, but it would be safe to have ten acres alongside, which we could get if we wanted to make the station twenty acres. Then we would need to import certain trees, some from Russia, some from Northern China, and some that we could get from Ames, Iowa; that is, we should import them from cold climates. We should propagate these enough to get them scattered in the country. Then for the experimental orchard, we should have three trees of each kind planted in it. That is not an expensive work, and the great beauty of the thing is that we know now what to import. We are not working in the dark now; we know what to import, and we know that our work is one of certain success. Another branch I would like to see is a forestry branch in connection with it. Why should not we import for trial certain varieties of forest trees? You may propagate them to scatter in a small way. At any rate I would like to see a trial timber plantation, with the different varieties of timber suited to this climate grown side by side, to test their comparative value.

By Mr. Irvine:

Q. Do you grow the Duchess of Oldenburg in Quebec?—Yes.

Q. Is it hardy?—Yes; it does well with us.

Q. It is a tree which grows in New Brunswick, even in localities where the thermometer goes down to forty below zero?—It is a most valuable tree. It is worth everything to us. We found apples on the Volga just like the Duchess, that we could not tell from the Duchess—a nice apple, with a little sub-acid and a mixture of sweet. I am looking for varieties of the Duchess.

Q. The Duchess is only a fall apple; we can keep them till 1st of January by taking pains with them. Have you discovered a good winter fruit?—There are a great many winter fruits. One thing I am most dogmatic upon is the keeping of fruits. In Russia they keep them better than we do.

Q. Do you know anything of the Wealthy?—It is the most valuable winter apple for the colder sections of our country that I know.

Q. Did it not come from Russia first?—No; it was a seed that came from Maine. What the parentage of it is, is a question. Mr. Gideon declares it is from a crab, but others doubt that.

By Mr. Fisher:

Q. Would the forming of experimental stations bring in such returns to the country as to justify the necessary expenditure?—Well, no other Government has looked upon this matter as a question of expense at all; they have looked upon it as an investment. We are singularly alone in having no experimental stations. All the other colonies—small colonies all through the Tropics—and not only those, but other countries, follow the example of the early Dutch and Portuguese colonists in starting botanic gardens wherever they start a colony, to see what will grow in the place.

Q. I would like to know whether you think the expense would be justified by the return?—It is a matter of very small expense. It would probably be a division, or a section, or a department of some larger work. As I say, we need from ten to twenty acres of ground. Of course, if you are having an experimental station you want one good, scientific man at the head of it. As far as the fruit and forest trees are concerned you want a good gardener, a man who is a good propagator, and under him occasional labor. It is not a matter of great expense. It is not the expense of a department of any of our agricultural colleges.

By the Chairman:

Q. What experience have you in the planting of forest trees?—In the planting of forest trees I commenced a little test timber plantation seven years ago. I planted out about a thousand trees. I planted our own white pine alongside the Scotch, our own tamarac alongside the ash and the Norway maple, our own spruce alongside the Norway spruce, and so on. Then I planted European white birch, white cherry, cotton wood, silver poplar, and so on. I would like to see a similar plantation here on an experimental station if it were established. My own plantation is beginning to show many interesting points. For instance, I have birch and Norway spruce planted together, but my Norway spruce are only two or three feet high, and will never grow any more, because the European white birch grows so fast that it is crowding them out and killing them. There are many very interesting points that can be seen with the eye on a plantation of that kind, and I would strongly suggest that something of that kind be started here.

By Mr. Foster:

Q. What is the plan adopted by the European Governments regarding forestry stations—take, for instance, Russia. You say they get possession of land for that and nothing else; then, how do they proceed?—The planting of these forests is different in different climates. In Germany, for instance, the great tree is what we call the Scotch pine. There is one good that has been developed as a result of these experimental stations. Western Europe now no more plants its own silver streak, but it plants instead Riga pine. This is perfectly straight in its trunk, and it is found to be a little tougher, more elastic, and a better grower. In Germany, where the climate is a little moist and the sun not so hot as on the Steppes of Russia, they plant their trees as close as they can, and as they grow, thin them out. They are so easy to grow and the plants so cheap. On the other hand, in Russia, where the winds are dry and it is more difficult to plant, they plant their trees eight feet apart each way, and then keep the side branches cut off until they get a certain height. But then the Russian Government works the Russian forests; it takes the forests under its care. The Department of Public Domains gave me figures regarding the forests they have, and I find they made out of them a profit of 2,000,000 roubles during the year. They have 752 forest stations scattered about.

Q. What is their source of revenue?—The sale of timber.

Q. Simply that?—I believe so.

By Mr. Fisher:

Q. I suppose in the German forest stations, where they plant their trees so closely, they thin them out at such ages that they can use the timber; they allow the trees to grow to a certain size and then take them out and use them for the different purposes that small timber will do for; then, after a certain number of years, they take out another class of timber, and so on?—Yes; in Germany they plant so closely that they have to cut out a large amount of stuff that is perfectly useless.

Q. But do they not, as they thin them out, take out much that is merchantable?—Yes; they set a value in Germany on small pieces of wood that we would not set any value upon at all. You asked me, some little time ago, about trees for the North-West, and I spoke of the silver poplar. That is a tree thoroughly adapted to the north. The wood is the best of all the poplars, but you cannot get a straight stick of any length. Now, at the botanic garden at Kazan, on the Volga, there are about fifteen trees growing in a single row—not growing close together, so as to cause straightness of trunk. These trees maintain a perfectly straight trunk, like the mast of a vessel, with no kind of wabbling or deviation. The tree grows in a dry soil, from cuttings, and will stand the coldest winters. The wood is of good quality. It is not so fast a grower as our Canadian wood, but still it is a fast grower. I think that tree is going to be of very great value to our North-West.

By Mr. Foster:

Q. Suppose the Government established one experimental station of the kind you speak of, what would be the best site for it, so that the results we would get from it would be applicable to the largest area?—You want to pick a middle climate—not a Niagara climate, not a Winnipeg climate, but something between the two. The idea, it seems to me, the Government should follow out, would be to get as many branches as possible. Now, the Iowa Horticultural Society has eight different little experimental stations in connection with one large central station. Minnesota has established about eight. I know one is at Fergus Falls and one is at Crookstown; and these are going to be of the greatest use possible to us in determining what we will grow in the North-West. Then take Jamaica; it has eight or ten Government plantations; the Government has bought land here and there and has planted it with specimens of chincona, oranges, cocoa and so on. I think you will find that the different Provinces would only be too ready to take up something of that kind, and more than that, they would support little branches.

Q. Where do you think would be the best site for a central experimental station?—I do not see why it could not be at Ottawa if you have good grounds here. You must have them near, so that people could go to them; you do not want to have them miles away from a city.

By Mr. Massue:

Q. How many acres would be required for the station?—I do not think we would need more than ten to begin with, but I would like to have ten alongside that could be acquired if necessary.

By the Chairman:

Q. Would the establishment of a Central Bureau, having for its object the collection of information upon all matters relating to agriculture and having a skilled staff capable of giving advice, making experiments, and noting the improvements effected in other countries that might be advantageously introduced into the Dominion, be a benefit to our agriculturists?—Yes; that is the very thing we want; but it depends upon what your Central Bureau is composed of. The one fault, the tendency to failure, and the one thing we have to guard against is, having men to carry out this matter who are political men. They should be themselves horticulturists. Now, there have been men as Commissioners of Agriculture at Washington who knew nothing, positively, about trees. That was too bad, and that is one thing we have to guard against.

By Mr. Foster:

Q. Would the man who knew the most about trees be the best man to be Commissioner?—The question of Commissioner I would not go into, but you must have for governing men, in such a case, men who are horticulturists. Ontario came to that conclusion some time ago, and the Government has put the Horticultural Department of the Guelph College under the charge of a Committee of three members of the Horticultural Society of Ontario. It has gone thoroughly into this thing. Now we are getting the best of the Russian fruits in by degrees. We have a number of little horticultural societies doing a great work in a little way. But here is a greater work to be done. We know these fruits to be existing. Our country, above or beyond a certain latitude, is pretty much without fruits. We have no machinery to carry fruit culture north-west to its extremest limits. Our local horticultural societies are doing good, but they cannot do that. We want machinery—machinery such as the States of Iowa and Minnesota have—for doing that work.

By Mr. Foster:

Q. How would you propose to get that machinery?—Simply, as I said before—something in the way of a testing ground. I do not like the term botanic garden; farmers do not like it; they think it is scientific nonsense; but some of the best experimental stations in the world are called botanic gardens.

By Mr. Fisher:

Q. As I understand your idea, it is that we should have an experimental station, also a propagating ground, from which large quantities of trees which are found by experiment, either in that garden or elsewhere, to be suitable, can be sent out into the country, either free or by charge, as the case may be—that is a matter of detail—so that there may be supplied to our agriculturists varieties that they could not otherwise get?—That is my idea exactly.

By the Chairman:

Q. Would the dissemination of handbooks about horticulture have a beneficial effect?—Yes; we want to know points about culture. There are many things that could be made known in that way. But the primary fact to get hold of is to raise all trees that will grow in our own climate.

By Mr Foster:

Q. If you had a testing ground and found out what was best and most suitable, could not those be imported in quantities direct from the countries in which they are grown?—There are a great many little troubles there. I know there were a few things that I and Mr. Budd, of Ames, Iowa, wanted to get from Russia in quantities, but fifty scions or twenty-five scions were all we could get. Sometimes propagators are not orchardists, and they could only give us the most limited quantities.

By Mr. McDougald:

Q. How do they send them?—By express; sometimes they are packed well and we get them all right, but sometimes it is the other way. To my mind, a very valuable race of trees are the Siberian poplars. They cost nothing to import and when you have them here you can propagate them to any quantity. Probably, if we had a few of those sent here we would find them very desirable.

By the Chairman:

Q. Is the importation of fruit trees into the country expensive?—No; you pay ordinarily for a tree what you do in this country, and the expressage is not heavy.

Q. Do you believe that a large loss is suffered, generally speaking, by our agricultural classes, on account of the want or insufficiency of agricultural knowledge on the part of many of our farmers?—Yes; but I hardly know how to answer that—

Q. Do you believe that a Bureau of Agriculture established in Ottawa here would remedy, to a great extent, many of the deficiencies in our present system of agriculture?—I do not wish to urge too many things; but I do wish to urge these two questions, experiments in fruits and in forestry.

By Mr. Fisher:

Q. I suppose, in those experimental stations, experiments could also be made in the propagation of farm seeds, in potatoes and cereals of different kinds, and probably

by the same scientific observers as conduct the experiments in fruit growing and tree propagation; also, if it is considered advisable, experiments in butter and cheese making could be carried on in the same establishment and under the same general management; thus you would have distinct branches of one large subject?—Yes; there could be branches looking to almost everything. Regarding that question of wheats, I would like to say a word. We saw very fine wheat in Poland, and when we were at Sawara on the Volga, which is just on the edge of the cold dry desert, the camels were bringing in loads of it. It seems to me that if we want to grow wheat in the Medicine Hat region we ought to import this Sawara wheat.

By Mr. Landry (Montmagny):

Q What are the industries that can be established in connection with fruit growing?—The general culture of fruits throughout the country. Of course, fruit began by being cultivated for home use; the moment a farmer finds he can not only grow it for home use but for the market, he becomes a commercial orchardist.

Q. What other industry would be encouraged here by the production of fruits?—Well, there are many questions that come up there. Now suppose we had a district in this Dominion like the district of Vladimer, in Ruusia, where cherries grow in tremendous quantities, and where the whole cultivation by the community is that of the cherry, we would soon have drying establishments and canning establishments, and the result would be a very large export trade. If we had a Province of Valdimer here in Canada, we would be shipping immense quantities of fruit to England.

Q. What do you think of cider making?—I do not know anything about it, really.

Q. What are the insects most injurious to fruits?—The worst of all insects, as far as the apple is concerned, is the coddling moth.

By the Chairman:

Q. Is the beet sugar industry carried on in Russia?—Yes; when we were going through Central Russia, that is the black lands of Russia, the prairie district of Russia, here and there we would come across a few thousand acres of beets, and in the centre a large factory with a big chimney, evidently a sugar factory. I understand that all the sugar in Russia, except a little cane sugar in St. Petersburg, is made there. The sugar is white and hard, and the curious point is that they are not up to making inferior sugar of the refuse. The result is that the refuse is exported to Germany and France, and only first-class sugar is made in Russia.

By Mr. Foster:

Q. Is the sugar beet raising done in Russia under the same climatic conditions as in Canada?—Yes; but they are growing it in countries more like Iowa, Illinois, Wisconsin, and in rich, deep, prairie soil, mostly.

By Mr. Massue:

Q. What kind of prairie trees would you recommend to be planted in the country?—We can increase the number of our aromatic trees very largely. I think I have between a hundred and a hundred and twenty varieties growing at Abbotsford. There are quite a number of maples that are interesting. My favourite tree is the cut-leaved European white birch. I think it is the most feathery and graceful ornamental tree we have.

Prof. ARNOLD, of Rochester, New York, called and examined:

By the Chairman:

Q. Would you tell us your experience in butter and cheese making?—I could not tell you the whole of it just now, it is so long. I have been in the business about all my life.

Q. By your experience, what are the deficiencies in butter and cheese making in Canada?—They are numerous; they are not alike in the different branches. If we take cheese, the obstacles in the way of success are, first, a want of skill on the part of manufacturers, and in the second place, a deficiency in the quality of rennet.

Q. Are these all the deficiencies you can remember?—No; there are a hundred, but those are the leading ones. There are a great many defects: in the quality of milk, in the care of milk, and in the handling of it in the making of cheese. Then there is an undue cost of production. One of the defects occurs with the dairymen themselves, and it consists of making the milk cost more than it should.

Q. How is that?—In the first place, they do not take proper care of their cows. In the winter they allow them to be exposed to cold, and it takes a great deal more food than otherwise would be necessary to sustain them. That makes the milk expensive. Then the cows are not sufficiently provided with comfortable buildings to protect them. Then they are not sufficiently fed. Dairymen think that if they feed enough to keep their cows alive that is all that is necessary. But more is needed. They need to store up in the winter a stock of health and flesh to be utilized in the summer. There is generally a sufficient food supply while the grass is fresh and green, but in the latter part of the season, or in the middle of the season, when the food begins to dry up, if there is not an extra supply furnished to supplement the pastures, so that they get enough, they shrink in their milk. I have taken pains to explain the reason of this, so as to induce farmers to do better. I have even gone into the physiological question, in order to show them how this scanty feeding operates upon a cow.

Q. Do you think the farmers make mistakes in choosing breeds for milk purposes?—Not so much in the breeds as they do in failing to select the best animals that they keep. They keep a great many that are not valuable, because they are unproductive. Now, in central New York, for instance, where cheese making is the principal business of the dairymen, it is estimated by good judges—persons familiar with the matter, being in the business—that all the profit made by dairying in that section is made from one-third of the cows kept, and that two-thirds of the cows yield no profit. One-third is kept at an absolute loss; the middle third, so to speak, just about pay their way, while the remaining third pays the profit. That difficulty, I find, arises largely from the improper selection of dairy stock.

Q. You spoke, a few minutes ago, about the deficiencies in cheese making; what deficiencies have you noticed in butter making, chiefly?—The deficiencies in butter making arise chiefly in the care of the milk and in the manipulation or making of the butter. The milk is generally in very good condition when it is drawn from the cow; the difficulties in butter making come in after that—in setting the milk to obtain the cream, and in the manipulation or making of the butter.

Q. Do you think very heavy monetary loss is suffered by Canadian farmers on account of the inferior quality of the butter made?—Yes; a very heavy loss indeed.

Q. I see that in Ontario a member has said that Canada is losing from $3,000,000 to $4,000,000 a year; do you think that that estimate is excessive?—No; I put it at $5,000,000; I think you lose fully $5,000,000 annually in defective manufacturing.

Q. Of butter alone?—Of butter alone.

Q. What steps should be taken by the Government, in your opinion, to disseminate useful information about butter and cheese making?—Perhaps as good a way as any is to give personal instruction. There are a good many ways in which the Government might facilitate the spread of the knowledge of the art. Now, in Denmark the Government supports a professor at the Royal Agriculture College, Copenhagen, and besides his duties as lecturer at the college, he spends a portion of his time every year going about the country from farm to farm. He does it in this way: He sends to some leading farmer and advises him that he will be at his house at a certain time, that he will stay two weeks and make butter and cheese there, and that all the neighbouring dairymen, dairymaids or dairylads, as the case may be, who want to learn to make butter and cheese can come there and question him, and see him work practically. In that way he gives practical instruction in the work, and those who attend his classes become quite experts. Then he goes to another centre for a time, and so he goes on repeating the instructions during a considerable part of the year. In that way he puts the industry ahead very rapidly. That is one method. In Ontario the Government furnishes money to the dairymen's associations, to be expended by them in employing instructors and in other ways to

distribute knowledge. Last year there were four instructors employed in giving instructions to cheese makers all summer. Three of them were paid by the Government and one by the convention. In that way they have put ahead the cheese industry very rapidly. The same might be done for butter making. Model creameries would be most excellent things to be instituted in the different Provinces, and the Government might employ teachers to go directly wherever they are called for. In Denmark a good deal of attention has been paid to new apparatus for handling milk, cream and butter. This apparatus was very defective; but the Government has paid men for constructing new machinery for butter making, with very advantageous results. The more you can do with machinery the better. The further removed the thing is from the necessary skill and judgment on the part of manufacturers, the better they get along. Let the thing be done by apparatus rather than by attempting to educate the makers into the intricacies of the art, because so many will lack judgment. They can make by rule if they have the rule, easier than they can make when so much depends upon skilful manipulation.

Q. Would a system of inspecting and branding butter and cheese stimulate producers to greater exertions and augment the value of the product in foreign markets?—I do not know. I hardly think it would amount to much. It certainly would do no harm and it might do some good. But an inspection of butter to-day would not be worth anything for to-morrow or a short time afterwards, butter changes so rapidly. With cheese it might have some benefit, but cheese is all the time varying and an inspection of it cannot last for long.

Q. Is Canadian butter bringing a lower price on the English market than the American butter?—No; I think not, and for the reason that the butter you export is mostly of your best grades. You export better butter than we do; our good butter is all consumed at home and we only export the very lowest grades. We never export anything above 22 cents, even when butter is high, and from that down. Our best butter is all taken up at high figures at home.

Q. Would you favor the establishment of creameries throughout the Dominion?—They are a very good thing. They are the stepping stone to what ought to be, and what probably will be in the future. They are a very convenient means of educating people to a certain extent in the art of butter-making. Creameries are very successful on our side, not that they make better butter than can be made in the private dairy or on the farm, but they make a uniform quality, and that goes a great way towards marketing it. Now, where there is a sparse population creameries are quite advantageous, because they bring the butter all into a centre where it can be sold to the best advantage. If a man wants to buy butter he cannot afford to travel from farm to farm and pick up samples, at a great distance, that would after all be unliked when he gets them. It costs too much. But if he can go to a creamery and buy a thousand pounds at one purchase, he can afford to pay 4 or 5 cents a pound more for it than if he had to travel round and get it, while the fact that the butter is all of one quality will add another 4 or 5 cents to it. So that it is more profitable to make creamery butter than dairy butter, as a rule. But creameries will never take the place of private dairying in the older settled portions of the country where the taste for butter is more aesthetic and where the facilties and the skill for making butter are more complete. The dairies, as a rule, make better butter than do the creameries, but then the creamery does not divide the proceeds equally. They count the milk by the pound. Now it happens that some milk is worth a great deal more than other milk. The man who feeds his cows and can produce a very rich quality of milk should get a great deal more for his milk than the man whose cows are only partially fed. But the system of purchasing both qualities is the same, consequently the poor milk gets more than its due and the good milk fails to get its due. This inequality will always work against the creameries, that is, where people have the skill to manufacture for themselves. Creameries on our side are the most prosperous and seem to be doing the best business and to be giving the greatest satisfaction in the west where butter making is just being introduced. In the east they are not so much in vogue. There, dairymen prefer to keep their milk at home and to make it up themselves, because they get more from it.

By Mr. Landry:

Q. Does not that inequality extend to cheese making?—Yes, Sir; there is the same inequality in the division of the difference, but the difference is not so great in cheese making as it is in butter making. The widest difference is in what is called the cream gathering system. This is very one sided. Cream varies a great deal more in quality than milk does. It has been shown by chemical analysis, that one sample of a given weight of cream may contain three times as much butter as another. Now, in the cream gathering system, on an average, they find that seven cubic inches of cream make one ounce of butter. The exact measure, they estimate, is $7\frac{1}{16}$ inches. Thus, 113 cubic inches of cream are calculated to make a pound of butter. Take a large amount of cream together, it averages that amount. In a recent test, where samples of each patron's cream were churned separately, it was found that, on an average, 113 cubic inches came very near making just one pound of butter. There was just two pounds difference in several hundred pounds of cream. But one patron's cream made twenty four ounces, instead of sixteen, while another patron's made only eight. The majority made less than one pound; five, out of twenty samples, made just one pound, and the rest made up the difference. It made a very unequal division, as amongst the patrons and such a state of things will be tolerated only where there is no other resort for making butter.

Q. A few minutes ago you spoke about pasture not being very good at the end of the season; can you suggest anything to improve those pastures?—Yes; the better way is to supply the deficiency with food raised outside of the pasture, to cultivate corn, peas, oats, millett, green corn or some succulent food to supply the defect. The pastures are not so much at fault as the weather. Any pasture will dry up in the middle of the season where you have a long dry summer. You are not troubled so much with that as we are. You have more rain in the summer than we have, and you do not experience any difficulty whatever in that respect in some portions of Canada. In the northern portions I have noticed that the grass remains fresh and green all summer. With us it gets very dry, especially in the west, where the middle of the season is dry for a long time, and the cattle suffer for the want of both food and drink. When once the cattle run down in consequence of this the quantity of milk is reduced, and they will not recover their former flow of milk, even if you supply them with the food afterwards.

Q. Is it possible to have anything like permanent pastures?—You can have permanent pastures, a great many dairymen do have them, but they will be subject to the fluctuations of the weather. The more moisture you have up to a certain extent, the fresher your feed will be; but when it becomes very dry, there is no ground that will not give way after a while, and the feed will fail. I do not know exactly though what you have reference to in permanent pastures; whether you mean a continuous supply of feed from one piece of land, or a piece of land remaining permanently in pasture.

Q. I mean keeping the pasture up by means of different kinds of grass. I understand that in Denmark there are different kinds of grasses that will grow at different times during the summer?—Yes; you can lengthen out the fresh food in that way. Some grasses mature early, and some mature late, and by varying the periods of sowing on the pasture field you can add very much to the length of fresh grazing. In Holland they have little or no difficulty in keeping fresh feed all the summer; the nature of their soil is such, and they have such an abundant supply of moisture, they can brave the summer there pretty well. In this country we cannot do that, except in some special localities.

Q. Would you favor the distribution of handbooks on butter-making?—It would be a capital idea if you can get the people to take them and read them. I think the movement of the Provincial Government of Ontario in distributing the handbooks it has sent out has been a very good one.

By Mr. Benoit:

Q. Is it more profitable for farmers around great cities, such as Boston or New York, to sell their milk than to make it into butter or cheese?—There is not much

difference. The cost of producing milk in those localities is so high that the producers do not make money. The farmers in the country, of course, have the advantage of raising their own feed, which they get at the bare cost of production. Those who produce milk near the cities, for the cities, on the other hand, have to buy the feed upon which some one has already made a profit. The farmers do not sell feed at what it costs; they usually sell it at 100 per cent. more than it costs. The man who buys it has to pay that profit and, as a consequence, it cuts down his profits.

Q. I understand milk is brought from a considerable distance into New York, and there are special trains for sending the milk into market?—There is considerable milk sent in from a distance, but they have to pay freight upon it. Thus the producer has to pay two or three profits before the milk can be disposed of, and that cuts down his returns.

Q. Do you consider it would pay farmers better to manufacture their own milk than to sell it in the great cities?—Generally.

Q. Can you tell us how they sell their milk?—They sell it tin vessels.

Q. Are they specially made for that purpose?—Yes.

Q. Is there anything new in that line?—Nothing specially new. The cans usually hold forty quarts and they fill them perfectly full, so that there shall be no jumping of the milk to injure it. These cans are carried on refrigerator cars to keep the milk cool.

Q. How far can they send it?—Three hundred miles.

By Mr. McDougald:

Q. You spoke about the deficiency in the character of the rennet in cheese making; can you suggest anything to overcome that?—We have made an effort to overcome it, but it is slow to be introduced. We furnish a number of establishments with liquid pepsine. It is perfectly pure and is free from any other animal matter than the pepsine. It is distributed by the quart or the gallon to the dairymen, as they prefer it. In the preparation of rennet, manufacturers are apt to get it tainted. It will get actually into a state of putrefaction, in which condition it will injure the quality of the cheese very materially. You must know that the soakings of a calves stomach in a state of puterfaction mixed with food would prevent it from staying good very long. You would be surprised to see the stuff some dairymen use in Canada and the States. The four instructors I spoke of reported to me a little while ago that they found 75 per cent. of the factories they had visited using rennet that was actually putrid, while the remaining quarter were using good material or rennet extract. The extract costs a little more than the raw stomach, and for that reason is slow to introduce.

Q. Is it prepared from the stomach?—Yes; it is prepared directly from the calve's stomach.

By the Chairman:

Q. Is there a very large difference in the prices of good and poor cheese?—Yes. the difference in price, however, is not equal to the difference in merit. Poor cheese is sold much dearer, in fact it is often sold above its merits, while the price of the other falls below its merits.

Q. Is not our Canadian cheese considered valuable on the English market?—Very good.

Q. But still it might be improved?—Very much; there is not 10 per cent., there is not 5 per cent. that is up to its possibilities.

Q. Very often we get cheese which is a little sour; what is the cause of the sourness?—There may be a number of causes for that; but the main cause is letting the curd lie in the whey while it is hardening, until the whey gets sour, and thus leaving all the sugar that remains in the curd in a sour state. The acid then counteracts the effect of the rennet which cures the cheese, and as a consequence the cheese does not cure. If the rennet was not injured by being subjected to so much acid it would cure the cheese sooner, and in doing that it would decompose the acid; but the cheese is not cured and it finally becomes alkaline.

Q. Is there any suggestion which you can make, by the adoption of which the Government might secure an improvement in the quality of cheese ?—If the Government saw fit to do it, it could put money into the hands of the dairymen's associations, and let them pay in part for the extract, so that the dairymen could get it as cheaply as they can get the rennet. The dairymen, if they had their choice, would take the extract in preference to the rennet, because it saves them a good deal of labor, and is not such a nasty mess to handle as the rennet is. By giving a little bonus in that way the extract could be made here and introduced ; and, when once the farmers used it, they will not use the other again. It cannot now be furnished as cheaply as the raw rennet. That seems to be the idea that strikes me, but it may be out of place to mention it.

By Mr. Benoit :

Q. I would like to have your opinion upon the creameries, combined with skim cheese ; what do you think of that process ?—The most profitable way of working up the milk is to make part cheese and part butter. That is the way they do in Denmark altogether. They scarcely make any whole milk cheese. They set their milk and skim off perhaps three-quarters of the cream that rises first. That makes a splendid article of butter, and that is one of the reasons for the extraordinary quality of the butter they send away. They only use the cream that rises first, and the first cream is the best. The remainder they make up into skim cheese for their own use.

Q. For market or for their own private use ?—Mostly for consumption in the country. I do not think they export much cheese. I think they have a home market for about all they produce.

Q. What is the price of that skim milk cheese compared with the other ?—It goes for all prices according to quality. It depends upon the skill with which it is made and the amount of the cream left in it. Where one-fourth of the cream is taken off the cheese is made generally as home-made cheese. There is no difference in it. In fact, I have often known experts to be mistaken in it. If half the cream is taken out it will reduce the value ; if three quarters is taken out, it will be poorer still.

Q. Is the price of skim milk cheese fixed on the market ?—The cheese is all sold under the tryer. Each lot is tested at Elgin, Illinois ; there is hardly a whole cheese sold on the market ; yet it is one of the largest markets in the United States. Almost all of it is skim cheese. The buyers come there and examine the cheese on market day, and when they are satisfied with it they make an offer for the lot. It goes for 7 or 8 cents a pound when full milk cheese would sell for 9½, 10 or perhaps 11 cents.

Q. What is your opinion regarding the difference in the valuation of the two cheeses—the skim and the ordinary cheese ?—The home-made cheese is generally the most valuable as an article of nutrition ; the skim cheese is very seldom perfect enough or cured enough to make it digestible. In testing the digestibility of the different kinds of cheese, I find that the skim milk does not digest as thoroughly as the other, though it contains more nutrition than the home-made cheese does. By absolute nutrition, I mean what goes to build up the frame work of the body, not the supporter of respiration or what produces fat. Skim milk contains more nutrition than the home made cheese, and it would be capable of building up more structure if it were as digestible. But it seldom is, and for that reason is not so valuable.

Q. Of your own knowledge, do you know of any attempt made to make the skim cheese successfully ?—Yes. The most successful mode of making skim cheese is to skim all the butter off—the cream off—just as perfectly as it can be ; and then introduce into the milk a little clarified lard—deoderized lard—or cotton seed oil, or both mixed together. Pour in a little of the oleine, one or one and a-half pounds to every hundred pounds of milk. Of this they make a splendid cheese ; it is very palatable and digestible and wholesome.

Q. It requires skilled hands ?—It requires some skill ; and then there is so much prejudice against anything of the kind that you do not make much headway with it.

It is curious how differently people look at it. While our Government is contemplating legislation forbidding the manufacture of such cheese, Holland is sending experts over here at the expense of the Government, to learn the art, with a view to introducing it there. They appreciate it; but our people do not appreciate it. To give you a little idea of the profitableness of it, I may say that our dairymen get, where they make whole milk cheese, as a net return for their milk, a little less than 1 cent a pound—that is a liltle less than $1 a hundred. The men who make this lard cheese, as we call it, that is, taking out all the butter they can get, and then making cheese with the addition of lard, get about 2¼ cents net for their milk. It is a vast difference, and the return in the one case is actually more than double the return in the other. But notwithstanding all this, the prejudice is so strong there is no getting ahead with it.

Q. Is the great oleomargarine factory in New York still in operation?—Yes.

Q. Manufacturing artificial butter?—Artificial butter.

Q. What is the price of it on the market?—It generally sells for about 2s. (25 cts.) a pound when the other butter will sell for 30 or 35 cents.

Q. It is higher than the common butter?—Higher than the lower grades of milk butter. The manufacturer sells it usually for about 17 or 18 cents. One of the manufacturers I know sold it wholesale at 19½ cents. That was an extraordinary price, 2 cents higher than any other oleomargarine buyer gets, because he made a nicer article.

By Mr. Landry:

Q. What are the nutritious qualities of that butter?—There is no nutriment in butter; it is only as a supporter of respiration that it is valuable, and there is no difference between butter and its substitute, in regard to the amount of fat it gives. One is as poor as the other. In fact, an analysis of them shows them to be almost precisely alike.

By the Chairman:

Q. You spoke of the oil for the oleomargarine: is it tallow?—It is oleine and margarine. Oleine is pressed out of tallow. Tallow is made up mostly of sheerings of hard, white fat. There is what is called margarine. Margarine is another hard oil, and fat, but not so hard as sheerings. Its density is about in proportion to its melting point. The melting point of sheerings is 145, that of margarine 120, so that it would be considerably softer than sheerings. The oleine melts below that. It is in a liquid state in ordinary temperature, and that is why we call it oil. Margarine and oleine are pressed out of the tallow and the butter is made out of them by churning them in sour milk with the cream and all in it. It runs out on pulverized ice which at once gives it the texture of butter, otherwise it would granulate or crystalize. In this way crystalization is prevented. The oleomargarine has the consistency of butter, and the flavor of butter, which it gets out of the milk it is churned in.

By Mr. Benoit:

Q. Does not that butter require some special provision for keeping it?—It keeps itself just the same as other butter. Before they churned it in sour milk there was no difficulty in keeping it for a length of time; but since they have introduced the method of churning it in sour milk to get the sour milk flavor, they carry cheesy matter into it which will decompose in a little while, and that changes the keeping quality of the butter. It will now grow rancid as ordinary butter does.

Q. They do not use brine to keep it?—No; it keeps as well as any butter.

Q. Not longer?—I do not think it does now, but it did before they introduced this element of sour milk into it. At that time it would stand in a warm room for days without changing, where butter would change at once.

By the Chairman:

Q. What do you think of the centrifugal machine?—It is probably the coming machine for separating cream; but it is not perfect yet. Probably in half the instances in which it has been been used, the butter has been perfect, and in the other half the butter has not been perfect. The fact, however, that some perfect butter has been made by its use is evidence that it can be, when we come to understand its conditions.

The machine, too, is too costly now for general use, and requires too much power to run it. It is, besides, too intricate for the common farmer to handle. It requires to be simplified, and probably in process of time it will be, so that a dairyman owning some forty or fifty cows can afford to use it. Of course, small farmers will never use it.

By Mr. Landry:

Q. What is the cause of the difference in the making of the butter with that machine; how is it that half is good and half is not?—The cause is in the way in which they get the cream off and the way in which it is worked. As some handle it, it gets a little greasy and there is too much friction. Others handle it so that it does not make that friction.

Q. I suppose it might have been caused in the preparation of the instrument itself?—Yes; it is probably all due to the structure of the instruments they use. The instrument is coming very rapidly into use on the other side. There are a great many of them sold. They save a great deal of trouble. They will probably be very much in use in the Southern States—more than in the north, because, in the Southern States they cannot keep butter long enough to have the cream raised, on account of the high temperature and the lack of ice and cold water. By starting the milk immediately that it comes from the cow, with a centrifugal machine, they can make cream into butter with perfect safety. It will, no doubt, have a more successful run there than it will have further north.

By the Chairman:

Q. Have you visited any experimental farms in the United States, owned by the Federal Government or the State Governments?—We have experimental stations. We have not many experimental farms. We have a few. All are supported by the Government. We have one at Geneva, New York, containing 125 acres.

Q. Do you think the results from these farms are good?—Very good. Most of the Eastern States have stations. Pennsylvania has them. Several of the Southern States have them, and most of the Western States.

By Mr. Landry:

Q. Do they take in all branches of agriculture?—General agriculture.

By the Chairman:

Q. Do the farmers derive benefit from them?—They are not deriving a great deal yet. The stations have not had time yet to do a great deal, especially the New York station. It has not developed any very great result yet, but it is in a fair way. It has a very able director. It cost $20,000 a year.

By the Chairman:

Q. Have you visited the experimental garden attached to the Department of Agriculture at Washington?—No. The Department, I may say, is doing a great deal of good. As an illustration of its usefulness, I may allude to the efforts that were made to induce the cultivation of sugar in the Northern States. That work was very successfully started, and with a fair probability of making sugar in New York, in the Western States generally, and even in the north-east, as successful as it has been in the Southern States or the West Indies.

By Mr. Benoit:

Q. Sorghum?—Sorghum.

By the Chairman:

Q. And that was brought about by the Bureau of Agriculture?—Yes. The enterprise was going on well, but with greater aid from the Bureau it would have gone on swimmingly; but it was all knocked on the head when the present Commissioner came in, for he put his foot down on it.

Q. Have any attempts been made by that Department to stop the ravage of insects?—Yes; there has been something done in that line. They publish reports every year containing the suggestions of the entomologist, a good many of which are quite valuable. They are considered to be of a great deal of use. For instance, to the cotton interest they have been useful, as they have shown how to manage the cotton worm and avoid it. They help us, too, a good deal, in the production of fruit.

Q. I have been told that the efforts of the entomologists have been very successful with the grasshoppers?—Yes.

Q. And that it is due to them that of late the grasshopper has not done much damage?—Yes. There were two or three entomologists sent to the grasshopper region to make observations and experiments. All reports concur in the opinion that they did a great deal of good, and that favorable circumstances combined, they have led to the wiping out of those insects. The grasshoppers are liable to come around again, but they have not done so yet.

Q. Some one told me they had found the source of the evil and the means of preventing it from spreading?—Yes.

By Mr. Benoit:

Q. Has the Government of the United States any such public institutions as they have in France, known as the Harras, for the selection of good horses and the keeping of good breeds for sale to the farmers?—No; we have no Government station of that kind.

Q. It is all left to private enterprise?—Yes

The Committee adjourned.

OTTAWA, 4th March, 1884.

The Committee met, Mr. GIGAULT in the Chair. F. X. PERRAULT, of Montreal, called and examined.

By the Chairman:

Q. What experience have you as an agriculturist?—I am a pupil of the Royal Agricultural College of Cirencester, England, and have taken my diploma at the National School of Agriculture of Grignon, in France. Since then I have edited the official organ of the Board of Agriculture of the Province of Quebec for twelve years. While in Europe, I travelled most of the continent, partly on foot, and visited the German Schools at Hohenhein, and many farms in Germany, Holland, England, Scotland, France, Switzerland, Belgium, Greece, Turkey, Russia and Italy. I have had several agricultural tours with a professor. I have acquainted myself, also, with the United States, and have travelled in the Western States as well as in the Eastern and Northern States, and have visited several agricultural schools there.

Q. Did you study the working of Bureaux of Agriculture in foreign countries?—Yes; I have visited, for instance, the Washington Bureau of Agriculture, with its branches, and I am acquainted with the gentleman in charge. I am of opinion that no Department in any part of the world is equal to the Department of Agriculture at Washington, either as regards the importance of the work accomplished, the high value of the reports published, or the practical results obtained.

Q. Could you describe the working of the Bureau of Agriculture at Washington?—The work of the Bureau of Agriculture is better described by their annual reports. The report for 1882, which I hold in my hand, contains 700 pages, fully illustrated with diagrams as to the production of crops, and the experiments made in the different Departments. I have no hesitation in saying, that of all the works published by any Government, the work of the Bureau of Agriculture stands the highest. They have full authority to treat of all agricultural and scientific matters; the scope of their reports is therefore more extensive than that of any other country, which circumstance is due to the variety of climates found in the United States, to the extent of territory, which is as large as Europe, and to the necessity of developing that territory under the most advanced principles of advanced agriculture. I have made a statistical calculation of the report published by that Department, and I find that 300,000 copies are printed yearly of their report, which averages 600 pages, and contains maps and illustrations upon all important subjects. Besides that, in 1883, there were published twenty-nine special reports on special questions, such as diseases of animals, special subjects for culture, injurious insects, forestry and so on. These reports cover 2,469 pages and 245,700 copies have been distributed; so that the total reports for the year amount to 3,069 pages and 545,700 copies. The illustrations,

which are numerous, are got up in the most scientific manner and most artistic style, and will compare favorably with anything done anywhere. Besides publishing these reports the Bureau has a botanical and propagating department which occupies the common around the agricultural building in Washington. This common is planted with all the native trees of America, besides all the foreign trees which can be profitably imported and acclimatized. The common and scientific name of each tree is attached to it and the collection is most complete. Besides that there are the propagating houses, which cover several acres. By the aid of these propagating houses the American Government has succeeded in making Florida, which was originally a useless waste of sand, one of the richest parts of the United States. This was effected simply by the culture of the orange. Millions of the plants of the orange tree were cultivated in Washington and duly despatched to Florida, where they have since grown and made excellent returns. Tea culture has also been advanced in Washington, and now tea is cultivated in the mountains of California. The cultivation of the vine has also been encouraged, with a view to the production of wine. Millions and millions of gallons of wine are now produced in the United States, and the production has caused very considerable anxiety in France. The cultivation of the vine has largely been directed through the Department of Agriculture; and so on with other plants. The Department has now taken up the culture of the silk worm. Of course the worm feeds on the mulberry. The mulberry tree requires certain conditions of climate and it cannot ordinarily be cultivated farther north than a certain degree; but they are pushing it. Now, there are extensive orchards of mulberry trees and they are multiplying the silk worm to a considerable extent, so that, no doubt, in a few years the United States will be in a position to supply itself with the silk it requires. It is the same with the sorghum, which has been introduced into most of the States and now grows millions of gallons of syrup, whereas, before, the cane syrup was the only article used. The Department has very much helped in the development of that industry. Again, the Department is propagating trees, and in the west they are studying the timber question, with regard to the western prairies. I would just here beg to state that all those questions which affect the Northern States —the border States of Canada—are applicable to Canada. In fact, in their reports there is no dividing line in their geographical maps; and the scientific lines which indicate the area within which a certain plant can be propagated are run through the Dominion as well as through the United States. So that really the Department of Agriculture here can take advantage of all these reports and apply them profitably to the circumstances of Canada, without being at the trouble or expense of getting them up. That consideration makes it so much easier for the Government of Canada to create a branch of agriculture at a very small expense. By consulting these reports for the last twenty-five years, you will find that there is scarcely a quesion which comes up in Canada in regard to cattle, the propagation of plants, forestry or fruit culture, which has not been thoroughly stated and thoroughly explained in their reports. So that a compilation of reports on a similar scale, applicable to Canada, could be easily made, and could be published at a very small expense. The illustrations, too, could be obtained from the United States. They are very free and hospitable in that matter. The Department of Agriculture might publish, for the benefit of Canadian farmers, a synopsis of these reports, which are most valuable, and relatively at a very small expense.

Q. What functions might such a Bureau as that at Washington perform with advantage in Ottawa?—I should think that the policy of Canada is to follow the United States in that matter. By following what they have done, the work can be carried on at relatively a small price at Ottawa, and you can get just the same results as those obtained in the United States. In fact, I have prepared a little scheme of the way in which it might be economically done in Ottawa, which I would beg to submit to the Committee.

Q. Will you be kind enough to read it?—First of all I would beg to refer to the fact that an agricultural branch has been established in Ottawa, and I hold in my hand the Order in Council which it established it. It reads as follows:—

"On a report published 17th April, 1877, from the Hon. the Minister of Agriculture, stating that the Department of Agriculture is now divided into three branches, viz.: Statistics, patents and immigration.

"That an agricultural branch has not yet been organized, although a most desirable one in an Agricultural Department, and recommending that he be authorized to make such arrangements as may be required for the organization of an agricultural branch, provided no additional appropriation be required by the Department for that purpose.

"The Committee advise that the requisite authority be granted.

"Certified. W. A. HIMSWORTH,
"*Clerk Privy Council.*

"To the Hon. the Minister of Agriculture."

This Order-in-Council was followed by the appointment of thirteen gentlemen as members of the Dominion Council, and I hold in my hand the report of the meeting of that Council, held on the 25th April, 1877. The Council was fully organized, with Hon. Mr. Christie as President. It divided itself into several Standing Committees, viz.: (1) Agricultural and Horticultural Boards and Societies. (2) International, Interprovincial, Provincial, District and County Exhibitions. (3) Agricultural and Veterinary Education. (4) Agricultural Statistics. (5) Museums, Library and Annual Report. (6) Forrestry and Public Domain. (7) Stock-raising and Contagious Diseases. (8) Field Operations. (9) Gardening and Fruit Culture. (10) Dairy Interests. (11) Home and Foreign Markets. (12) Injurious insects. One of the members was was appointed to treat on one of each of these questions, and to make a report at the following meeting. Unluckily the absence of all funds to pay the travelling expenses of the gentlemen, and even the expense of printing the reports, prevented any further action. Mr. Christie would not call a meeting unless the Government would pay the travelling expenses, as in Ontario, but the Government did not feel itself warranted in doing that. Still, as a matter of fact, the Branch has been organized and the Government can continue it by filling up the vacancies in the Council. The whole organization has been established, and if it has not proceeded to work it is due to the fact that no appropriation was made to meet the expenses of carrying out the proposition. I thought that explanation was necessary as a preliminary. Now, here are my suggestions:—

"In the month of April, 1877, on the report of the Hon. C. A. P. Pelletier, Senator and Minister of Agriculture, an Order in Council was passed by the Privy Council appointing a Dominion Council of Agriculture, composed of prominent agriculturists of each Province, with instructions to advise the Minister of Agriculture on all questions involving the agricultural interests of Canada.

"On the 5th of that month the first meeting of the Council was called and held in the rooms of the Hon. Speaker of the Senate, the Hon. David Christie, who was appointed President of the Council; Mr. J. X. Perrault was appointed Secretary, and twelve Standing Committees selected, covering all the subjects which were properly entrusted to the direction of the Board.

"This was practically establishing the agriculture branch of the Department of Agriculture. The Council was then adjourned to meet at the call of the President.

"During recess the Hon. Mr. Christie called on the Government to provide for travelling expenses of the members of the Council, so as to allow them to do justice to the important work entrusted to them; also, for an allowance for office and sundry expenses.

"This allowance having been declined, the President would not take the responsibility of calling the Council together at the expense of members, and no other meeting was held since.

"The Bureau of Agriculture of Washington, which has an annual appropriation of $500,000, is undoubtedly the best conducted Department of Agriculture in the world. Its annual reports are standard works, which are held as authorities on all

agricultural matters. The work done by the Bureau and the results obtained are immense. At an agricultural point of view, there is no dividing line between the Northern and Western States and the Dominion of Canada. In all the elements of agricultural production and wealth we are one country. Therefore, all the various questions, affecting stock or field productions, which have been so thoroughly investigated in the border States, at Washington, may be applied to Canada. No doubt arrangements could be made to obtain the use of the illustrations or extra copies of the reports for distribution in Canada. By following the course adopted by the American Bureau, the following divisions might be put in operation at once, at reasonable cost to the Government:

"1. *Division of Gardens and Grounds.*

"The Government grounds, both in the city and Rideau Hall are ample for plant propagation. Glass houses only would have to be provided; the gardeners already attached to the grounds giving their services to the Bureau, under proper direction.

"2. *Botanical Division.*

"Prof. Bell, who is attached to the Geological Survey, contributed a most remarkable collection to our Paris Exhibition, and might probably be available to take charge of this division, in connection with the gardens and grounds, without breaking his connection with the Survey.

"3. *Microscopic Division.*

"4. *Chemical Division.*

"The Geological chemist might be intrusted with the work connected with this division, when required, without interfering with his ordinary duties. The Geological Department is under the charge of our most scientific men, and in receipt of a large annual grant. These gentlemen would, no doubt, with pleasure, give their assistance as scientists, to the investigations intrusted to them by the agricultural branch.

"5. *Entomological Division.*

This Division also might, with advantage, be left to the scientists attached to the Geological Survey.

"6. *Division of Statistics.*

"Agricultural statistics could be economically obtained through the 500 agricultural societies of Canada. In each township the director of the society would fill up the printed forms by basing his estimates on so much per cent., more or less, than the last official Census printed on the forms. These forms might be filled four times a year.

"The secretary of the County Agricultural Society would control the township returns and establish the totals for the county.

"A statician for each Province would receive and control these county returns and prepare a provincial report for the statistical department at Ottawa, where the final report for quarterly publication would be prepared. The work thus organized would not entail a large expenditure and would be sufficiently accurate for all practical purposes. The statistics obtained in the United States are due largely to voluntary work, and the officials connected with our agricultural societies will be found both able and willing to give their co-operation in this important work.

"7. *Veterinary Division.*

"Our Quarantine staff already organized and attached to the Department of Agriculture could, with advantage, take charge of the work of this division when required, entailing no additional expenditure of any importance.

"8. *Departmental Reports.*

"The Washington agricultural report is printed yearly at 300,000 copies, averaging 600 octavo pages, with illustrations and maps on all important subjects. In 1883 twenty-nine special reports have also been published, amounting to 2,469 pages and 245,700 copies. The total reports for that year thus amount to 3,069 pages and 545,700 copies, besides several hundred illustrations. A large proportion of this work applies to Canadian agriculture as well as that of the United States and, properly compiled, should be distributed to our agriculturists.

"9. *Forestry Division.*

"When it is remembered that the importation of forest products by Great Britain amount annually to $500,000,000; that our forest exports in 1883 amounted to over $25,000,000 and that our forest production in Canada is estimated at $70,000,000, the importance of this division cannot be exaggerated. The management of forests, as adopted in Europe, so as to secure, by rotation, the permanent production of timber, is yet unknown in Canada. The best mode of propagating trees in the North-West is yet a matter of experiment. Both these questions should receive, by the forestry division, immediate attention.

"10. *Seed Division.*

"The Washington Bureau has distributed, in 1883, 2,038,935 packages of seeds through Senators and members of Congress, and a grand total of 2,467,230 packages altogether. The same agency could be secured in Canada. Our representatives at Ottawa would willingly, during parliamentary Session, attend to the proper distribution of seeds between the progressive farmers of their constituencies. The supply would all be obtained from the gardens, grounds and propagating houses of the Department, so that this would not entail a large expenditure, the distribution being done through the Post Office Department.

"This organization being properly applied, I am under the impression that an appropriation of $25,000 would meet the whole expenditure of the agricultural branch, as detailed above.

"J. X. PERRAULT."

Of course many of the officers mentioned may be gentlemen now attached to the Civil List, and receiving salaries, who will be only too happy to help the Bureau of Agriculture to publish reports on important matters that may arise. It will be easy, from the reports of the Washington Department, to make reports. The illustrations are always the most costly part of the report. If you get them from Washington our reports would not cost 10 per cent. of what the Washington reports cost the United States. As to the number of copies we might publish, I should say that we would require nothing like 300,000. Five thousand, I should suppose, would be a large edition for us. I should think that 5,000 distributed every year among agriculturists would do a great deal of good and tend to increase considerably their productions. With reference to my proposal on the subject of forrestry, I may say that one is surprised, when travelling through England or France, to see more wood there than in Canada. Every person there takes good care to keep up the growth of the productions of the forest. By a system of rotation this is quite possible. If it takes fifty years for a tree to be fit for timber you have a fifty years' rotation. You divide the forest into fifty parts; you take down one-fiftieth and replant one-fiftieth every year. Thus, at the end of the period you find the forest just where it was before, and although you have cut off a considerable quantity of timber, still the permanency of the supply is not altered. That system applied to Canada would yield the same results as it does in Europe, and in fifty years we would have just the same quantity of timber as we have now. The system applied in Europe is altogether unknown in

Canada, and it would be important that the forrestry division should get the idea known. With reference to the distribution of seeds and plants in the United States, let me say that the members of Congress distribute them among their constituents. They know where to send them, and care is taken of them by those who receive them. The propagation of them then goes on at a very great rate, and they are spread all over the United States in that manner. These plants do not cost much. They are propagated in the houses of the Government at a few cents a piece or a cent a piece; others of them are the seeds grown in the garden. If the grounds around the Parliament Buildings here, at Nepean Point, and those around Rideau Hall, which cover fifty acres, were utilized to propagate vines and other plants for distribution among the people of Canada, they would be a fine sight to begin with, and this would not cost a great deal, for the Government has gardeners already employed. If these were directed to plant useful plants, the cost would be but a trifle, and much good could be done, for the plants could be distributed by millions all over the country, as at Washington. The entire organization would not entail a large expenditure. By utilizing the services of the gentlemen now in the pay of the Government, who are attached to the Geological Survey as scientists, by utilizing the ground in the control of the Government, by utilizing the agricultural societies of Canada—of which there are 500—for the collection of statistics, by making use of the services of all those persons who are willing to help, the whole organization might be got up very cheaply, and would answer the purpose as well as the Washington one.

Q. What appropriation would be necessary?—There would, of course, have to be a gentleman in charge of the agricultural branch who would be a specialist, and probably an assistant. Then the gentlemen attached to the Geological Department might receive a supplement for their assistance; but they would only be called upon occasionally, because the first duty of the Bureau would be to analyze the Washington volumes and extract from them the results they have obtained at Washington. The building of a few propagating houses would cost something, to begin with. But I think $20,000 a year would cover the building of the houses and the extra help which would be required for the gardeners, the two or three employees who would constitute the agricultural branch proper, the scientists and the statisticans, one of whom, I think, would be necessary for each Province. The gentlemen who are in the statistical department now would do that work. Then the printing would have to be included: that is, the printing necessary to the publication of the reports. These would be the necessary expenses. With a Dominion Council of Agriculture composed of a few representative men from the whole Dominion, who would receive no salaries, I think a proper direction would be given to the agricultural branch. These gentlemen could superintend the work of the branch in the various Provinces whence they come. Such Boards now exist in every Province, and if they are found necessary in every Province, it is equally necessary to have one for the whole of the Dominion, particularly as the expense would be but a trifle. I think a Council would be a very useful appendage to the agricultural branch, although it is not an absolute necessity. In Washington they have not a Council. The Commissioner there, Mr. Loring, is practically the Minister of Agriculture; and now there is a motion before Congress to establish a Minister of Agriculture, the Minister being one of the Secretaries of State. They have only five Secretaries of State and they want a sixth, who will be in charge of Agriculture.

Q. Do you believe the establishment of a Bureau of Agriculture would have the effect of increasing our agricultural products and to improve the quality of our agricultural products?—Naturally, of course, getting these plants, importing seeds and so on, are all very expensive operations for the farmer. Our farmers have neither the leisure nor the means to carry out these operations as a Government will. Then if the Canadian Government called upon the Washington Government to give them a collection of what they have in Washington, the request would be granted immediately without costing a cent. This kind of thing is done by one Government for another every day. But if an individual were to ask for such a favor, having no authority to back his application, and being unable to give a guarantee that he was

not engaged in a private speculation, his request would not be acceded to. So that a Canadian agricultural branch might obtain immense collections from foreign countries.

Q. Do you think a large monetary loss is suffered by our agricultural classes on account of the want or insufficiency of agricultural knowledge?—I believe so. There is, I may say, no agricultural library in the country. There are some very interesting journals on agriculture, which give daily operations; and their editors are glad to give them. I see Mr. Weld here, who is the editor of the *London Farmers' Advocate*, an agricultural paper which has a very large circulation, and which I have been reading for the last twenty-five years. This gentleman has no subsidy of any sort. He has to make a paper for sale, and he is governed in his enterprise by circumstances. He cannot publish a work of that standing which requires costly engravings, scientific research, and so on, which are altogether beyond private enterprise. It is well known that scientific works cannot be published as a speculation. At the same time, it is only by having these reports widely spread through the country that we can educate the agriculturists of Canada to be the equals of the agriculturists of the United States, who receive such reports gratuitously and can educate themselves thoroughly on all agricultural questions; it is only by these reports that we can educate our farmers to compete with the American farmers in the markets of the world.

Q. Under what difficulties does the present system of agriculture labor, and in what respect is the Canadian farmer placed at a disadvantage when competing in foreign markets?—As to that, I consider that we are in a very difficult position, as farmers, to compete for the sale of our products. Of course, our great market is the market to the south of us—the American market. To those who were farmers twenty years ago, it is well known that when we had reciprocity we had very large prices for our barley, oats, &c., and that we had the greatest facilities for selling them. But now, as we have to pay an average of 20 per cent. on all the agricultural products we send to the United States, we are obliged to find a market for a great many of our products on the other side of the water. I have taken the trouble to prepare some statistics of the value of products we have exported to the United States, compared with the value of the products of the same class produced by the United States for the year 1882-83. I find that we have exported, for instance, 12,635 horses, of a value of $1,597,611, on which we paid 20 per cent. That is, we paid $319,522 to the Government of the United States for the privilege of selling our horses to the Americans. Of course, there is a theory that it is the buyer that pays the duty, not the seller, but when we come to look at the fact that there are ten millions of horses in the United States, we cannot suppose that the 12,635 we have sent there have altered the market price. The horse buyer who comes here to purchase a horse knows, if he can sell it for $250 in New York, he will have to pay 20 per cent. to get it across the line; and he will knock off $50 on the price in Canada, because he has to pay that amount to the Custom House to get it into New York. I have had practical experience of that. I sold a couple of Percherons to an American buyer, who said: "If you will get them across the line I will give you $50 extra right off." I will not trouble you with all details of our exportations of agricultural products to the United States; but I will give you the general result. I find that of animals we exported last year $3,006,435, on which we paid duty to the extent of $601,286. Of field products we exported $11,527,769 worth, on which we paid $2,271,762 duty. Of animal products, butter cheese, and so forth, we exported $485,043 worth, on which we paid a duty of $197,128, something like 40 per cent. Now the same productions in the United States are these: there are of animals in the United States, $1,349,389,091 worth; of field products for the year, there were $1,126,661,015 worth. Of the same products we exported over $11,500,000 worth to the United States, that is about 1 per cent. Of animal products there are in the United States for last year, $450,000,000 worth; we sent them similar products, butter, cheese and so on, $485,000 worth, or about one-tenth of 1 per cent. We therefore cannot pretend, in that case, that the buyer pays the duty. The drop we send into the sea of production of the United States does not compara-

tively amount to anything. It cannot affect the market price at all. Therefore, it is the Canadian farmer who pays the American duty. We sent $15,000,000 worth of these agricultural products into the United States, and we paid $3,000,000 of American duty. In other words, we paid $3,000,000 for the privilege of sending $15,000,000 worth of agricultural produce into the United States. I consider that this is a great drawback to the Canadian farmer.

Exportations to the United States, 1882-83.

ANIMALS, &c.

No.	—	Value.	Duty.	Lost by Agriculturists.	Value of United States Products.
		$		$	1879. $
12,635	...Horses	1,597,611	20 p.c.	319,522	573,254,808
23,280	...Cattle	516,585	20 "	103,317	586,487,255
3,634	...Swine	11,301	20 "	2,260	110,613,044
228,541	...Sheep	723.650	20 "	144,730	79,023,984
.....	...Poultry	157,288	20 "	31,457	
268,090		3,006,435	20 p.c.	601,286	1,349,389,091

FIELD PRODUCTS.

					1883.
Bush.					
8,741,626	...Barley	6,245,263	15c bush. 20 p.c.	1,311,243	30,090,742
142,325	...Beans	212,282	10c. " 10 "	14,232	.....
607,953	...Oats	275,320	10c. " 30 "	60,795	150,243,565
368,697	...Peas	381,084	10c. " 12 "	36,869	.....
912,486	...Rye	605,801	15c. " 20 "	131,872	18,564,560
878,471	...Wheat	841,738	20c. " 20 "	175,694	474,291,850
103,036	...Other	57,684	10c. " 20 "	5,768	.....
tons 89,005	...Hay	843,404	20 p. c.	168,680	371,811,084
brls. 1,329,641	...Malt	1,136,556	20 "	227,315	.....
2,181,631	...Potatoes	928,637	15c.	139,296	81,062,214
		11,527,769	(10)	2,271,762	(6)1,126,064,015

ANIMAL PRODUCTS.

					Estimate.
986,337 lbs.	...Butter	206,154	4c	39,455	? 300,000,000
221,529 "	...Cheese	24,468	4c	8,861	? 50,000,000
13,913,744 doz.	...Eggs?	? 2,251,304	No duty	.....	.....
1,207,582 lbs.	...Wool	255,043	10c., 11 p.c.	148,812	? 100,000,000
		485,665		197,128	450,000,000

RECAPITULATION.

—	Duty	On a Value of	Value of United States Products.
	$	$	$
Animals	601,286	3,006,435	1,349,389,091
Field Products	2,271,762	11,527,769	1,126,064,015
Animal Products	197,128	485,665	450,000,000
	3,070,176	15,019,247	2,925,453,106=½ of 1 p.c.

J. X. PERRAULT.

By Mr. Irvine :

Q. Do you think that the Tariff we have, which is called a retalliatory tariff, has bettered the condition of the farmer in this respect ?—I have no opinion on that. I take the fact that we have paid that amount of money for the privilege of selling to the Americans, to whom, in spite of the $3,000,000 we had to pay, we were obliged to sell, as an evidence that the farmer has drawbacks.

By Mr. Fisher :

Q. As I understand your argument it is that, because our export is so very small in proportion to what is there used, that we have to pay the duty ?—Yes ; our export is so very small that it does not vary the market.

Q. You do not lay it down as a general principle that the buyer does not pay the duty ?—No ; in our case it is but a drop that we are sending there, at least that is how I look at it.

Q. But that does not controvert the general principle, that the buyer does pay the duty ?—I do not discuss that question. Now, there is another country in which we might have a very fine market, but from which we are debarred, and that is France. There is a very large demand for our products there, such as cheese, butter, hay; in fact we did send some oats and grain there. But there is an arrangment, which as you will immediately see, debars us from that market. It is this. There is no direct communication between the two countries, and what is the result? The French Goverment has a law under which all products entering France from a foreign port, other than that from which they were first shipped, have to pay a duty of $7.50 a ton, in addition to all the other duties. I exported, myself, some samples of pressed hay to France. At that time the additional duty was even more; I had to pay $10, because they had necessarily to be taken by way of Liverpool. They did not touch the wharf at Liverpool, but were transferred from the Canadian steamer to another steamer going to Havre. Because they had been transferred I was charged, when I arrived at Havre, another $10, on the ground that they had come through a foreign port. As we have no direct steamship communication with France, our cheese, our butter, and all our products that have to take the route by way of England, have to pay that extra duty, whilst the people of the United States, having direct lines to France, are exempt from it.

Q. Is there a very great quantity of agricultural produce exported from the States to France ?—Yes ; I have seen the steamers of the Transatlantic line filled to the utmost capacity every trip.

Q. What kinds of agricultural produce?—Agricultural produce of all kinds; cured meats and so on. They send an immense quantity of Indian corn directly to France—millions of bushels—and it is used in distillation.

Q. Is any quantity of dairy produce exported to France by the United States?—A great deal of cheese, butter, and so on. Whilst we have no direct line to France we are debarred from that market, which is really a large one. I was referring, a short time ago, to the question of importing foreign seeds by private enterprise. I, myself, imported some foreign wheat, some Black Sea wheat, from Russia, several years ago. I have here certificates regarding that wheat, and after reading them, I will tell what was the result of the importation. This is the sworn statement of the seller before the British Consul General for the Russian ports on the Black Sea, the Sea of Azof, and so on, regarding that wheat:—

"Appeared personally at the British Consulate-General, at Odessa, before me, George Alexander Stevens, Esq., Her Brittannic Majesty's Acting Consul General for the Russian ports of the Black Sea and the Sea of Azof, Michel Bernstein, Esq., of Odessa aforesaid, for some time Commissioner, representing Russia at the Universal Exhibition at London, &c., &c., who declared that the 1,500 bushels of Black Sea spring wheat, sold by him to Joseph Perrault, Esq., delegate of the agricultural societies of Canada, now at Odessa, has wheat grown in the neighborhood of Odessa, thoroughly well conditioned, and the finest lot of seed wheat procurable on the market, out of the actual colossal deposits now existing in the granaries of Odessa.

"The said appearer also hereby declared that the said 1,500 bushels of wheat have been, this day, shipped in bags on board the Russian Steam Navigation Com-

pany's Steamship "Odessa," for London, for transhipment to Canada, its ulterior destination.

"In faith whereof the said Michel Bernstein, Esq., has affixed his hand and seal at the British Consulate General aforesaid, this 12th day of February, 1869.

"Michel Bernstein, signed before me and resistered in the Notarial Register of this Consulate, sub-entry 445.

"GEO. ALEX. STEPHENS,
"*Acting Consul General.*"

Here is the certificate of the Consul:

"It affords me much pleasure to certify that, through my introduction and recommendation, Mr. Joseph Perrault, as delegate of seventeen agricultural societies in Canada, has been assisted in the choice and purchase of 1,500 bushels of Black Sea spring wheat by the most competent parties in Odessa, and that the 1,500 bushels so purchased of Michel Bernstein, Esq., and shipped this day on board the steamship "Odessa," for London, in bags, is considered by connoiseurs as a splendid sample, not inferior to the best samples of seed in Odessa, where there are, at this moment, several millions of bushels of grain awaiting shipment.

"GEO. ALEX. STEPHENS,
"*Bri ish Consul General.*

"ODESSA, 12th February, 1869."

This seed was imported into Montreal early in April, and the agricultural society gave a certificate that it was according to order, and all that sort of thing. In fact, I delivered it only on condition that they were perfectly satisfied with the seed imported. It took a great deal of money to get the wheat, and I did it all at my own expense. The dealers, including Mr. Ogilvie, refused to take the order for it, on the ground that it was too late in the season to get it. So I left here on Christmas Day to secure it, and was back here in the first week in April, after having gone to Odessa for it. The society took the seed, and although it did not appear in the samples that the seed was mixed, when it grew we found that the beards were not of the same size; some were 1 inch and some were 2 inches. The society then declared that it was not pure wheat, but that it was mixed; and I am sorry to say several societies declined to pay me, and I was at a loss of $1,500 through the society which had given me the order. I came to the conclusion that it is impossible to go to Russia and to import the seed in a perfectly pure state, because it is not sown in that state in Russia. It is the practice in Europe very often to mix two varieties of seed, so that according to the weather the two varieties help one another and give a good result. I went to a great deal of trouble and lost considerable money in the undertaking, so I fear I cannot advise, from my experience, anybody to import Black Sea wheat into Canada.

By Mr. Orton:

Q. Have you much knowledge in regard to Russian fruit trees, and do you know if they would succeed here?—I have no information upon that subject. My impression is that we have some very excellent fruits now; and as Secretary of the Canadian Commission at the exhibitions in Paris and Philadelphia, I know that our fruit was admired as being equal, if not superior, to anything exhibited by other nations.

By Mr. Massue:

Q. What is your opinion of agricultural colleges as a means of educating the agricultural classes?—Being a pupil myself, having passed four years in an agricultural college in Europe, and having visited the German agricultural colleges, I am aware of what is being done in Europe; and I have no hesitation in saying that in buildings, organization and general results, the American agricultural colleges are far ahead of anything in Europe. Particularly can this be said of the school at Lansing. That school is the most complete school of agriculture there is. The

grounds are immense. The professors have all their own residences on the farm; splendid colleges, surrounded by ornamental trees. The pupils are located in a dormitory, and there is a restaurant, where they take their meals. There is an immense laboratory, where they do their work, and a dissecting room, where the dissection of the horse and other animals is performed. The museums of geology and botany are the most complete museums of the kind. They have immense out-houses, where they do the propagating of plants, and immense grounds besides They have most of the improved breeds of stock in their stables. Of horses, cattle, sheep and swine, they have representatives of each breed, so that the pupils can become acquainted with the points of each. In fact, the collection is a regular live museum, to which they can go and judge for themselves. At the same time, the productions of these animals are sold in the neighborhood for re-production. As to farming, they have the best agricultural implements constantly in use, from the plough up to the threshing machine. These pupils handle all these machines, and they have a thorough course of lectures in mechanics and the construction of implements. How, the implements should be constructed to obtain a proper pulverizing of the soil and the proper placing of the seed on the ground, and at the proper depth. The school of agriculture at Lansing is thoroughly organized. There must be a million or a million and a-half of money spent there, and there are on an average 200 or 300 pupils—young men and boys. The pupils have to be of a certain age, and they have to pass certain qualifying examinations in grammar, arithmetic and the elements of chemistry, before they can be admitted. After four years study they come out of the school with a very thorough education and qualified to do their work in a very thorough manner. At Guelph, I believe the school is very thoroughly organized and I think it is a pity it is the only school of the kind in Canada. We have schools in Quebec, but they are not carried on at all on that principle. The pupils are young boys, and are taken from the uneducated class mainly. Of course, we have some exceptions, and I am glad to see in Mr. Landry, who was a distinguished graduate of one of those schools, a gentleman who was one of those exceptions. Generally there is one professor, who is a gentleman who has made no special study of the matter, but has gathered some general knowledge. He has often to teach his pupils reading and writing; and as you know, it is impossible to teach them botanical and veterinary subjects if they cannot read or write. I believe in the matter of agricultural schools Canada can take some lessons from the United States. In 1862 the United States appropriated 10,000 acres of public land for each representative in Congress and in the Senate, for each State. New York, for instance, had twenty-seven representatives, so it got 270,000 acres of public land. This land was given in trust to the State on the condition that the State would buy the farm and put up the buildings necessary for a school. The appropriation was simply to secure the proper professors, and the appliances and instruments necessary for the professors, such as museums, and so on. The different States passed laws accepting the grant and they immediately made offers to the different localities to subscribe in order to secure the college. Some towns that were ambitious to have the college, subscribed $50,000 or $100,000 towards it for the privilege of having it in their neighborhood, the Government besides making an appropriation towards it. Splendid farms were then secured and splendid buildings put up, and then the appropriation of the general Government went to pay the professors who, in several instances, were brought from Europe to take charge of the institutions. The consequence was that there was established in the United States a system of agricultural education equal, and even superior, to what obtains in Europe, after a great many years of work there in the establishment of agricultural colleges. I think it would be quite practicable for the Canadian Government to appropriate some of the lands in the North-West, of which there are millions of acres, for the purposes of agricultural education. Parliament could give to each Province so many thousand acres for each representative it sends to Parliament. Of course it would not be fair that Prince Edward Island, with its small population, should have the same as Ontario with its millions; but by giving an appropriation in proportion to

the number of representatives in Parliament, every Province would have sufficient to allow it to do what the United States have done, and to have agricultural schools where the sons of our farmers would get a thorough education. Of course, in Ontario there is a school, but in Lower Canada there is really no education for the farmer, and the consequence is that the sons of our wealthy farmers do not continue in farming. They go out into the professions, but do not follow the profession of agriculture. There is no place in which they can study the science; and as, if they continue in agriculture, they have to carry it on in the drudging way in which it is carried on, there is no inducement for them to remain. The consequence is, as I have said, our wealthy farmers do not continue their sons in the avocation they are pursuing themselves, and the capital so necessary to work out proper farming goes out of agriculture, under which circumstances farming, necessarily, cannot be progressive. In France, in England, in Italy, where I have been, wealthy young men follow agriculture, and they think it is the calling of a gentleman to be an agriculturist. Agriculture is placed in those countries almost above every other calling. Here, on the contrary, as the people who wish to devote themselves to agriculture in Quebec cannot get the proper education they would like, they go into other callings and the result is detrimental to agricultural pursuits.

Q. You do not mean to say that the Province of Quebec is alone in that?—No I speak of that Province as I am acquainted with it, it being the Province in which I reside. I do not speak specially of the other Provinces, because I am not thoroughly acquainted with them. I merely point to the result in Quebec.

By Mr. Orton:

Q. Was the appropriation in land, made by the United States Government, land held by that Government in the various States in which the schools were established? No; the public land.

Q. Principally in the North-West?—Sometimes in the States, and sometimes in the West, where they had it. There was scrip issued on those lands by the Boards appointed by the several States, and they raised immediately sufficient capital to go to work and establish these schools. The same thing could be done here.

Q. Their colleges, then, are really kept up by the Federal Government?—The educational part of them. The fund raised by means of the land grant is permanent; it cannot be touched. The Federal appropriation is for the educational part of the enterprise. The buildings, the farm, and what are necessary to work the farm, are provided by the State Governments.

By Mr. Fisher:

Q. You say that scrip was issued; are you aware of any instance in which that scrip has been redeemed?—I do not know; I have not followed it any further. I know, though, that the colleges are all very wealthy

Q. Well, they got the money for the scrip that was sold, but whether the buyers saw their money again is a question?—I do not know how it turned out for the purchaser.

By Mr. Landry:

Q. Is there an agricultural industry that, you think, can be profitably established in this country?—Yes. Of course, we have already the cheese and butter industries, which are extensive; there are about three hundred of them in Quebec and I think that more can be established with advantage. Then the beet root sugar industry: it is a great industry, and our climate is perfectly suitable for it, judging by the investigations that have been made on that question by the Department of Agriculture at Washington. I may say that during the exhibition of 1878 I was acquainted with a gentleman who was there as the representative of the United States, and often talked with him on the subject of beet root sugar. He made a special investigation of the question in France, Belgium, Austria, Germany, and so on; studying the climate, the nature of the soil, the quantity of rain that falls, the degrees of temperature, and so on. We also studied what may be called the profitable lines of the production of beet sugar in America, taking in Canada as the Americans always do in their reports. His report of four or five hundred pages, thoroughly illustrated, is the most thorough study, I

think possible, of the question of the beet sugar industry in America, because it gives the whole experience in Europe. There is a map of Europe with a dot on every spot where there is a factory there. There are statistics showing what the production of each factory has been, the yearly crops, the average percentage of sugar, the expense of putting machinery up, and the final result as a business enterprise. Applied to America, his lines do not go into California, because there was a test made in California of that industry. There was a beet sugar factory started there, but it was not a success. This gentleman, in his report, shows that the want of success in California was due to the fact that the climatic circumstances would not allow the profitable production of the beet root there, and that it was not within the range of beet-root cultivation. But the report shows that the whole of Canada is within that range. The report is to be found in the Library here, and it can be easily consulted. My opinion is that the beet root sugar industry can be made a success in Canada, just as it has been in Russia, Germany and elsewhere, where thousands of millions have been produced. I know it has not been successful in Quebec. And why? We called upon farmers who had not grown it before to take an acre apiece. They used the land as it was; it had no previous preparation; no manure or anything. It was common land that was taken in many cases. The farmer went to work first to secure his ordinary crops, and when he had done that he said, "Now, I am going to grow some beets." Not having the implements, not having the experience, not giving them sufficient care, the crops did not yield as they would yield if the beet crop was the main crop. It must be the main crop where there is a sugar factory. I have seen the factories at work in Europe. I have seen one farmer with 300 acres of beet roots. He did not wait until other crops were arranged for to look after his beets. He made them his main crop. At the farm school where we were, they had ninety acres every year for the use of the cattle. In England turnips are cultivated by the hundred acres. It can be done here, to a certain extent, though not perhaps so largely; but to cultivate the beet root successfully in this country, it must be done upon a large scale, with improved implements, with the land well manured and fall plowed, and with the beet as the main crop. Then, if the beets are planted early, in soil well tilled and well pulverized, they will have a good chance to spring up and give a good crop. If the work is done by horses, instead of by hand, as in Lower Canada; if all the operations are carried on economically, I am persuaded that with private capital and private farming the cultivation of beet root sugar in Quebec would revolutionize the Province and make us what France has been made, for it is the beet that has saved France. I have visited the farm of Mr. Decrombeck, at Leus, near Arras, north of France, where there was a sugar factory. This farm has 300 acres of beet roots, and the owner has 400 head of oxen always fattening in his boxes. Every week forty oxen go out fat and forty go in to take their places. The pulp is accumulated in immense silos and preserved there during the winter, and in summer is used for feeding the stock. Besides that, there is an immense quantity of linseed cake, that is not only used to feed the stock, but as manure. Guano is also used as manure. Mr. Decrombeck has a factory, in which he turns his beets into sugar. That is the first operation. Then he has a refining apparatus, with which he takes the brown sugar, as the Redpaths do, and makes it into white sugar. The pulp he uses to fatten 400 cattle all the year round. It takes about two and a half months to get them profitably fat to be sent to market. The animal is tumbled into a box four feet deep. During the two months and a-half he is feeding and fattening he never leaves the box. By feeding he gradually raises himself up, and just as he comes on a level with the floor he is regarded as being sufficiently fattened, and is sent to the butcher. The animal usually increases in weight by some five or six pounds a day. The moment the increase is less than a pound or a pound and a-half per day, the animal is sent to the market. And so the operation goes on. On this there were two crops in rotation. And what were they? Beet and wheat; nothing else. There were no oats, nor anything of that kind. One year there were beets in immense quantities; the next year wheat—thirty-five bushels to the acre. It is beet and wheat all the time. The

owner of the farm, who commenced with nothing, and was originally a 'bus driver, is worth millions.

By Mr. Orton :

Q. What size was his farm ?—Six or seven hundred acres, farm buildings and everything.

Q. How long did they keep the cattle in the stalls ?—All the year round, and they were kept on the refuse of the beets. He not only consumed his own beets but those of his neighbors, who cultivated on a smaller scale than he did. In any place in Europe where there is a sugar beet factory, the proprietors produce the nucleus of their raw material, so as not to be dependent upon the half acres of anybody else. In Lower Canada the beet was grown fifty or sixty miles from the factory and carried by rail or boat to its destination. Of course that could not pay. Before the beet got there it cost a great deal of money to carry, and a great deal of it was damaged, smashed and so on. If a factory is to succeed in Lower Canada, or anywhere else, the beet root must be the main crop of the party that starts the enterprise; he must have the nucleus of the crop in his own hands, in order that there may be a certain number of tons sure for the factory to run upon, and then other parties may be invited to join and help. The moment we have the beet root, then we have the manure; and it is only through manure that we can quickly improve the agricultural resources of Canada. The question in Lower Canada is the production of manure. It is a costly thing now; while if we grow beets and sell them and get the refuse, it is equal to selling the beets and keeping them; that is, if the beets are properly treated. There are two systems of treating the beet. One is by diffusion. The beets are cut and put in water; the water diffuses all the substance in the beet and carries it away in a cheese. Then the pulp is not worth a great deal. But if the beets are put into a box and pressed by high pressure there are always certain elements which remain The pulp so treated is in a first-class condition to be absorbed by the animals, and to be converted into beef, milk, or anything else; and it is considered that the pulp is worth almost as much as the beet itself. So that disposing of the beets and getting the refuse is like selling them and getting them again. Under these circumstances the operation is profitable to the farmer; besides he secures the element of manure, which, for his land, is the main element. If we could get that industry started in Lower Canada, where sugar is so much consumed, there is no doubt that the land would double in value, as it has done in France. It is only since the introduction of the beet sugar industry into France that the land there has doubled in value. So I think it is an industry which should be fostered by the Government. Of course it is well known that Napoleon offered a reward of $1,000,000 to the party who should succeed in making sugar out of beets; and that is how the industry was begun. The science is now known everywhere; but still if there was some encouragement given to the person who would start such an industry, the thing would benefit the whole country, and it is admitted that what benefits the whole country should be paid for by the Government of the whole country. In Lower Canada, although the sugar beet is first-rate, although the percentage of sugar from the beets is good, still there were not sufficient beets produced, for the factories built in Quebec swallowed up a hundred tons a day. In France the factories work ninety or a hundred days in the year. They get through their stock of beets and stop, while here they could go only four or five days, because they had not sufficient production to keep them going. Those half acres entrusted to farmers who had no experience did not yield sufficient beets to give a satisfactory result. As far as getting the sugar out of the beet was concerned, however, the result was perfectly satisfactory.

Q. At what time in the year does the sugar beet come to perfection ?—In the fall. There is a very great advantage in Canada, because we have a cold climate, which is entirely in our favor. The beet, after it is housed, continues to vegetate. I have seen in France, where it is warm, and where they have not cold weather, the beet continuing to vegetate after it is housed, and the sugar becoming cellulous. There is a depreciation of probably 10 per cent. in the value of the sugar in the beet

in consequence of that In our country, on the other hand, where it is so cold in winter that vegetation cannot go on, it is stopped at once if you allow the cold air to get at the beet. Therefore, you can keep your beet for five months in Canada without losing any of the richness of its saccharine substance.

By Mr. Fisher:

Q. Will it do to allow the beet to freeze?—It will not hurt it at all; but it will be more difficult to rasp it in the factory. Still it is not necessary to have it frozen to stop vegetation.

Q. How do they store the beets in France?—They store them in a trench in the field, and they throw on top a little straw; after that, the earth that has been taken out of the trench is thrown on to the depth of about six inches. But the beets have never suffered from the cold. In the coldest winters in France they have never suffered.

Q. One of the great difficulties found, a year ago last fall, was that a great many of our beets did get frozen and spoiled; and there was a very great loss as a result?—Well, if the beet freezes and thaws it becomes corrupt; but if the frost remains in it, it is preserved just like meat or any other substance. If you allow the frost to go out, it has the effect of breaking the cellules of the plant, and when the cellules are broken the plant is dead and goes to corruption. But it does not take away the sugar if it remains frozen. In extracting the sugar you place the beet on a rasp, and the sugar is there just as when you dug the plant.

Q. In this country you will have to provide necessary cellars for the accommodation of the beets, which will add necessarily to the expense, and that is one of the things that will tell on the profit and loss?—Of course we have here immense duties for the protection of the industry.

Q. Not more than in France?—In France there is an Excise duty of 100 per cent.; that is to say, the sugar that brings 5 cents a pound in France pays an Excise duty of 5 cents to the Government. Thus, the French Government raises three or four hundred millions out of the home-made sugar. We have no excise duty here.

Q. What duty do they place upon imported sugar?—The same; the duties correspond.

Q. But is not the duty on imported sugar so much higher than the Excise duty upon home-made sugar as to give the manufacturers of sugar in France as high a protection as we give our sugar manufacturers here?—That is not my impression. You know France exports sugar.

Q. And the Government gives an export bounty?—Not now.

Q. They did for a long time?—Well, what is exported does not pay Excise duty. They do not pay duty on exports; they pay Excise duty on the sugar consumed. Actually, the sugar in Paris is worth 13 or 14 cents, while in England it is worth 7 or 8, because in England they have no duty, and the French sugar going there has no excise duty to pay. The French sugar sold in England is 30 per cent. cheaper than the same sugar sold in France, on account of the Excise duty put on in France.

Q. The protection on the imported sugar must be equivalent to the Excise or they could not do it; if the sugar can be sold cheaper in England than in France, and there was no import duty, it might be taken to England and returned to France?—They do not do that; they have an import duty equivalent to the Excise duty.

By Mr. Orton:

Q. Do you think the cold climate of our North-West would militate very much against the beet sugar industry there?—I do not think so. The cold has nothing to do with it. In the north of Russia the industry is carried on most successfully. In the report on the subject, published in Washington, of which I just have spoke, you will find marked the precise location of every factory in Russia, and you will see that there are fifty or sixty factories in the north. It is known that the beet root sugar of Russia is the richest in Europe: in fact, the farther north the beet root is grown the larger the percentage of sugar. In the Washington report there are tables

indicating the richness of the beet root in the different localities in which it is grown. By consulting those tables you will find that the more northerly you grow the beet the quicker it grows, the more rapidly does it come to maturity and the richer it is in sugar. The beet has been greatly inproved in Europe. There are large farms there that do nothing else but produce the sugar beet seed. It is an immense industry. There are farms of five and six hundred acres devoted to the growth of the beet sugar seed. On these farms there is a large laboratory, and the chemist tests every beet root seed they wish to put in the ground. They use only those that promise a large percentage of sugar. And what is the result? They have come to produce 16 per cent. of sugar. A 100 pounds of beet to-day will yield sixteen pounds of sugar. I remember, twenty-five years ago, when I was in France as a student that 8 per cent. was considered a very high average for the beets; but since then, by proper selection by chemists, the have increased constantly the saccharine richness. The Silesia beet is the best sugar beet; it is immensely rich in sugar; but growers have assured me that the varieties that yield 16 per cent. have only been brought to that stage by proper selection and proper culture. Of course, the Silesia beet is specially chosen.

Q. Do you think the Federal Government ought to undertake the culture of the sugar beet and manufacture the sugar, instead of private enterprise? Do you think that that would be the surest way of creating that industry in Canada?—It is an industry that applies to all the Provinces, an industry which will double the value of agricultural land all over the country. The Federal Government will be the first to benefit by that extra richness of the country; and rather than allow each Province to multiply the experiments and the expense, it will be better for the general Government to do that work itself, because the experiments done at our expense by the Federal Government will be useful for the whole Dominion. If you leave the work to each Province you will have eight experiments to be made, and it will cost eight times more to make them than if they were made once by one Government for the whole country. I think it is the principle of our Federal system that where you have a general subject the general Government should carry it on for the whole of the Provinces, because general wealth will follow and because it will benefit the general Government quite as well as it will benefit the Local Governments. In the present case increases of importation will follow, the consumption of imported goods will be larger, and the duties collected will increase a hundred-fold over the amount expended by the Federal Government in promoting the industry for the good of the people. On that theory I think it would be for the general Government to do its share in promoting everything to the general interests of the people, as they do in Washington.

By Mr. Landry:

Q. Do you not think there are in this country obstacles, such as the shortness of the seasons, which calls for all the labor at one time, the devoting of our farms to other crops, and so on, that will always prevent the cultivation of the beet root as the main crop?—I do not think so. I think the inducements offered by our Tariff to the industry are very great. The duties on sugar average, I think, 35 or 40 per cent., and that is so much to the benefit of the enterprise. Then there are no Excise duties upon the sugar, as in France. Besides this there have been great improvements in agricultural implements. To-day machinery replaces the hand in a great many instances. Of course there are some operations that cannot be performed except by hand; but still they are minimized by the employment of implements. We want the industry here very badly, and I think we can find the people necessary to do the work, if the thing was started on a large scale, as in Europe. Here, undoubtedly, as the farmer has his land, he has no capital to work the land. In Europe to carry on beet culture you must have as much capital as the price of your land, in order to get proper manure, proper cattle, proper implements and everything else. It is the same here; but, unfortunately, though we have the land we have very little capital to work it.

By Mr. Orton:

Q. The land requires to be very well worked up?—It requires a lot of capital; it is only the company that has the capital to start a factory that can do it. The factory in Berthier cost $300,000 in buildings. They ought to have $100,000 or $200,000 now to produce the beet, without which the factory is of no use.

By Mr. Fisher:

Q. Do you think it is possible to get, in the neighborhood of the factory, the labor necessary for the raising of a crop of beets, for a supply?—I think so. You can bring labor there. The great difficulty, of course, is in the hoeing season, when you want all you can get.

Q. The labor is only required for a short time, probably a fortnight or so; the rest of the year it is not required; can you get that labor?—I think so. Hoeing takes place between the sowing season and the hay time. There is a lapse of a fortnight or three weeks between the two, and it is then that hoeing comes on.

Q. But it comes in the haying too?—Not if the beet is sown early. It would, of course, if you were to sow the beet in the month of June, when you have done everything else. But my impression is, that by sowing it early as the main crop, the hoeing will come on between seed time and haying; there is a fortnight then when there is nothing pressing on the farm, and at that time we can get the people to come there and hoe. The pulling of the beets is, of course, another operation. But where you wish to grow a hundred acres of beets, you require a large *personnelle* all the time. You must expect to have a large number of people there all the summer; and you can use the women and children to do that work, to a certain extent. By paying the people properly to go into the work you can get them. It is done in Europe. To those great farms in France the people go from Brittany to do the hoeing; they work there for a fortnight or three weeks, make a large amount of money, and then go back to their own country to continue their operations. There is quite an emigration in Europe from north to south, and back again from south to north, at that time, and the same thing might be done here.

By Mr. Massue:

Q. Is it not your impression that if skilful hands had been imported to settle near the Berthier factory it would have been a success; because then, instead of having beets from an acre of land, here and there, they could have had them from a large farm?—Exactly. That is what I said from the first. I said the company should start themselves the nucleus of their factory.

By Mr. Orton:

Q. Beets are just as easily cultivated as turnips?—The same thing.

Q. In our counties through Ontario, where they can feed cattle, they think nothing of raising eight, or ten, or fifteen acres of turnips for their cattle?—But if, as with beets, they could sell their turnips, and get them back to feed their cattle, it would pay them better.

The Committee adjourned.

OTTAWA, 5th March, 1884.

The Committee met, Mr. GIGAULT in the Chair. Mr. WILLIAM WELD, of London, Ont., called and examined.

By the Chairman:

Q. What experience have you as an agriculturist?—I have been in the country here a little over forty years, and have cleared up a farm. During the past eighteen years I have devoted myself to publishing an agricultural journal—*The Farmers' Advocate.*

Q. Do you think that the dissemination of handbooks of agriculture would have a beneficial effect?—I think it would have a beneficial effect.

Q. Do you think that the establishment of a Central Bureau, having for its object the collection of information upon all matters relating to agriculture, and having a

skilled staff, capable of giving advice, making experiments and noting the improvements effected in other countries that might be advantageously introduced into the Dominion, would be a benefit to our agriculturists?—I think such is now, in a measure, being carried out. I do not know that it would be beneficial to establish another one at the present time. I consider that the information can be obtained and given by our agricultural journals in the country.

Q. You do not favor the establishment of a Central Bureau here, in Ottawa?—Not at the present time. I think it requires further consideration, and that we should see how those are acting that are already established.

By Mr. Bain:

Q. When you say there is a Bureau already established, you are referring to that of the Province of Ontario?—Yes; I think the question requires due consideration.

By the Chairman:

Q. What reasons have you for objecting to the establishment of such a Bureau?—Only that private enterprise can give the necessary information.

Q. So you do not believe in any Government action, or Goverment measures, on behalf of agriculture?—I think if they encourage existing enterprises - enterprises now established in our own country—greater good would be done.

Q. What do you mean by that; how could the Government favor the Bureaux which are established now?—By aiding the dissemination of information through such mediums as are established. For instance, we have our agricultural journals they can gather, if they have any assistence at all, all the information that is necessary or profitable for the country.

Q. Have you studied the working of the Washington Bureau of Agriculture?—I have not particularly studied it. I am aware that they are publishing a very vast fund of information, and we can easily compile and take from theirs what is beneficial for our country.

Q. Do you think the information given by the Bureau in Washington is not useful?—I think it is very useful.

If it is useful there why should not a Bureau be useful in Ottawa?—Possibly a good deal of good might be done by it.

Q. Have you noticed any appreciable deficiency in the crops of your district, owing to the depredations of birds and insects?—Yes.

Q. Do you think the farmers are losing a good deal on account of the ravages of insects?—Undoubtedly, they are.

Q. Do you think there are any means of destroying insects which are injurious to vegetation?—There are means being taken to destroy them.

Q. Did you see the report of the Entomologist at Washington, who says that the farmers lose more than $100,000,000 every year on account of the insect ravages to vegetation?—I do not doubt its correctness.

By Mr. Massue:

Q. Have you any agricultural colleges in Ontario?—There is one at Guelph.

By Mr. Landry:

Q. Do you think that a Central Bureau in Ottawa, under the control of the Dominion Government, would be more advantageous to the farmers than a Provincial Bureau?—I think that had such been established by the Dominion Government at first, it might have done more good. Whether established in Ottawa or elsewhere—I do not care where—it would have been better established under the control of the Dominion Government.

Q. Supposing it were established now, would it not be beneficial?—I look at the expense—at the expediency of going to the expense. I think the expense would be hardly justifiable. Look at the enormous expense incurred by the Washington Bureau. I think we would not be justified in taxing our farmers to that enormous extent.

Q. What are the expenses of the Washington Bureau?—From the testimony received yesterday, I think $300,000. I believe that is what Mr. Perrault said.

Q. Do you know anything of the expense, of your own knowledge?—I have not examined into it myself.

Q. Do you know what are the benefits the States gain by that Bureau?—I cannot answer exactly what they gain.

By Mr. Fisher:

Q. Do you not think that even with the provincial colleges and experimental stations there is a good deal of work applicable to the whole country which a Central Bureau should undertake, and relieve the Provincial Bureaux or experimental stations of?—I do; I think there is a great deal of work that might be done.

Q. Which, if it were done by the Provincial Governments, would have to be done in each Province, but if once done by the Federal Government would apply to the whole of the Provinces?—I believe it might be.

Q. In that case the establishment of such a Federal Bureau might be of advantage, although Provincial Bureaus have been established in some of the Provinces?—Certainly. I think so. My principal objection is on account of the enormous cost and the additional taxation we should have to be placed under.

By Mr. Landry:

Q. What would be the cost?—Judging by the progress our Ontario Bureau is making I think we should soon arive at an expenditure equal to that at Washington.

By the Chairman:

Q. But do you not know that the services of many of the officers the Government has now could be utilized?—Not without additional cost.

Q. Do you believe that agricultural knowledge should be disseminated?—I do.

By Mr. Landry:

Q. Do you think, if the profits derived by the community, by the dissemination of agricultural knowledge, are higher than a Central Bureau costs, that the question of cost should arrest the establishment of it?—I think the question of cost should arrest the establishment of it.

Q. Have you many subscribers to your paper?—I have.

Q. Could you give the number?—About 17,000.

Q. Could you give the circulation by Provinces?—I can. I can give the number of post offices in each Province that I send to; not the number that goes to each post office.

Q. Out of the 17,000 subscribers, how many have you in Ontario?—I did not expect to be called here to-day. It was quite accidentally that I was called. I would have brought my papers to show the figures, had I expected to be asked that question. I have the figures down exact; but I cannot exactly state how many I have in the Provinces without referring to my papers.

By Mr. Bain:

Q. How many agricultural papers are there published in Ontario—I mean papers that make agriculture a specialty?—I think there are four.

By the Chairman:

Q. Have you any suggestions to make to the Committee which you think might be favorable to agriculture?—Yes. I understand that it is proposed to distribute 250,000 pamphlets, at the present time, in regard to dairying; am I correct?

Q. This Committee never spoke of that?—Well, I think the information might be given to greater advantage by placing it in the hands of a journal or journalists, through whom it will fall directly into the hands of those who desire such information. Those things that are generally given away are valued at the price they cost, as a general rule. I was enquiring of Mr. Perrault, in regard to the publication and distribution of agricultural papers in Quebec, and he informs me that they were sent off in bundles and never opened.

By Mr. Landry:

Q. Did he follow the bundles?—I am not told; but he informs me of this. I have further enquired of really progressive, intelligent farmers there, and they say that the papers are of very little use and are not read.

By Mr. Fisher:

Q. Did they give the reasons for that?—Yes; that there is not suitable information in them.

Q. It is not because they get them for nothing; it is because the information in the papers is not what they want to get?—Yes; but I look upon such papers as rather detrimental than beneficial to the agriculturists, as they tend somewhat to prevent the circulation of papers that the farmers endorse, that the farmers pay for and require.

By Mr. Bain:

Q. How would you remedy that difficulty; would you propose that advance sheets of the evidence be furnished to the agricultural journals, so that they might reprint them at their discretion?—Certainly. They would be very glad to publish such information as they deem to be of any benefit or profit to the farmers—information such as is sought for by the readers of those journals.

Q. As a journalist, you would be pleased to publish it, if it were furnished to you, without cost?—If I could get it in a condensed form, such as I know the farmer would read, but not in the form of a Blue-Book. The farmers who do not take agricultural journals are not the foremost in new enterprises at all. It is to the subscribers to agricultural journals that these look for information.

Q. There is no doubt that the men who subscribe to agricultural journals are the men who are the most advanced in their profession?—And the others look to them for information.

Q. Have you thought this matter up; is there any direction in which you think something could be advantageously done by the Central Government here, outside of the question of statistics, or anything of that sort?—I think tree culture might be advantageously taken up. I think, too, that analyses of soils and manures and entomology, are subjects that might be advantageously taken up here.

Q. Our local Entomological Society has done a great deal in that direction in Ontario?—A great deal; it is doing a very good work.

Q. Then how would a Central Bureau be, in reference to the introduction of new trees and plants that might be adapted to our climate?—I think encouraging farmers to plant more would be one means; another one would be to remove the duties on trees coming in from the United States and from Europe. The duties should be removed from fruit trees and trees of all kinds. Let us have as free access for trees as possible. Some may say that this would check private enterprise, but the result does not show it. The very foremost of those who were clamorous to have the duty placed on trees, George Leslie, for instance, one of the oldest and largest established nurserymen in this Dominion, are now in favor of its removal. I think the farmers, too, would support me in asking for that; that is my impression.

By Mr. Fisher:

Q. Have you any further suggestions?—Mr. Perrault, in his remarks, said we were unable to make here illustrations in regard to plants, insects, trees, &c.

By the Chairman:

Q. He did not exactly say that; he said only that it would be expensive to have them made here, and that if we were to get them from the United States it would be cheaper?—His remarks were, "Mr. Weld cannot give the necessary illustrations, as he has no subsidy." I am asking no subsidy, and I would like you to examine this book (*The Farmers' Advocate*), which I am furnishing for $1 per annum.

By Mr. Fisher:

Q. As I understood Mr. Perrault, he referred more to Governmental reports, and not at all to such publications as may be the result of private enterprise. I did not understand him to cast any reflection upon private enterprise?—Now, if you wish to disseminate the information I have referred to, I could easily do it for a very small sum, an infinitesimal amount in comparison. My paper now is established seventeen years. It has received no subsidy, and is as free as I can make it from party lines. It is devoted entirely to the benefit of agriculture. If you were wishing to give any information in regard to the Bureau, I would give it here in pieces, according as we

may deem it necessary to feed the farmers with it, or I would place a separate sheet with it in the paper. I would do it at the actual cost of paper and printing, and without profit. In regard to the distribution of seeds and plants which you speak of, I think it is far better to leave that in the hands of the seedsman and nurseryman. The distribution was tried many years ago in Toronto, and it failed.

W. H. LYNCH, of Danville, P.Q., called and examined.

By Mr. Fisher :

Q. I would like you, Mr. Lynch, to give us an idea of what can be done by a Central Bureau, such as we are talking of, to encourage and help the manufacture of butter in the country ?—From the experience I have had, I believe it would be impossible to fully estimate the good that would come from the establishment of such a Bureau, in connection with even this one industry. The dairy industry is in a peculiarly bad state—a fact acknowledged everywhere ; but there is a disposition all over the country, as I can show by a great deal of documentary proof, to look upon it as a possible large industry, as a specialty for the country. In other words, the industry is becoming very popular, and I think it is the opinion of many leading men throughout the country that the Government has a work to do in regard to it, and any help given to it would be popular. I have attended dairymen's conventions for the last three years, and there has hardly been a convention that has not adopted a resolution asking something from the Government. The precedent for Government action is certainly not wanting. Denmark, which now has the acknowledged highest place as a producing country in this line, and in consequence has a large export trade, has attained this position by Government action. It will be seen by reference to documents bearing on the question, that for fifty years Denmark has been, through the Government, giving great attention to this important industry. The assistance has been given in an increasing ratio. During the last few years they have been giving more attention than ever to it. The results of the work in Denmark are that they now ship butter to warm climates, where other countries find no foothold. In Ireland, the action of the Government, combined with that of private enterprise—or, as one may say, through the patriotism of individuals—the industry has been improved, by the aid of a travelling dairy, which has left its track wherever it has been. In Ireland at one time they made an excellent article of butter ; there was everything, too, to show that the country was adapted to butter making ; but owing to the change in modern living and the progress of events, it came about that rich butter was left in the market. Now, however, it is taking its place again, doubtless largely through the help of the travelling dairy. The work done in England has been productive of good results. And wherever there has been anything done by the help of a Government which could not have been done by individuals, the results have been more than commensurate with the cost. In our Province of Quebec, one of the best things the Government has done for some years has been, in my opinion, the encouragement of this industry, and the results are observable all over the Province. When Prof. Sheldon was brought out to St. John, New Brunswick, last fall, it was supposed that he was going to introduce something new to the country. His intended visit was advertised far and wide, and people went to St. John from all parts, even from Ontario, to see him. One of the instruments he showed was a centrifugal machine, what was generally supposed to be a new feature. But it was found that we had several of those machines in Quebec, and two of them were away up in the Saguenay district, where it was supposed that there was nothing but blueberries. Thus, Quebec was found to be to the front. There has been an agitation in the Maritime Provinces with a view to fostering the industry, and the result is that they have finally determined to do what they can to further it by Government action. A difficulty stands in the way, however, as I can show by one or two letters I have, and that is the question of means. This simply points to the necessity, in my mind, for Dominion action, because where the need may be recognized provincially, it may, for one reason or another, not be

carried out. That leads me to this point: that the Dominion can do once for all what each Province would have to do separately, and what each Province might neglect to do owing to its conditions. I cannot speak in too emphatic terms of the importance of the Government doing whatever it can to further agricultural industries—all branches of them—and I think that the general opinion of the farmers will be that the results will be manifold, and the expenditure one of the best that can be made. I admit that there is an opinion abroad that there are useless expenditures in the way of Government action, Agricultural Councils, and so on. To give you an illustration of the way in which this opinion is held, I may say that just before our Dairymen's Convention a leading farmer began to oppose the grants by Government in aid of agriculture. I said to him, "Did you ever think what a small proportion of the Government expenditure is in this direction? Did you ever make a comparison between the results in this direction and the results in many other directions?" He then admitted that it was really a foolish thing for a farmer to be the first to find fault with a Government expenditure for the furtherance of agriculture. He was one of the leading farmers in our district. I find there is a feeling in our country, whatever there may be in the States, in favor of expenditures by the Government in whatever way seems feasible to further agriculture. I do not know but that I have gone beyond the question.

By the Chairman:

Q. I see by the report of the Agricultural Commission in Ontario that by the action of the Danish Government the price of butter increased a good deal; that the butter produced in Denmark has risen in price 5 cents a pound; do you believe there is any truth in that?—It has been the result wherever it has been tried, to my knowledge.

By Mr. Fisher:

Q. Did it not effect that in Quebec, in consequence of the action of the Agricultural Council in regard to cheese making, and is it not a fact that to-day there are cheese factories established there where, fifteen years ago, there was no cheese made, and that the production of cheese throughout the Province has increased enormously?—Yes, it is a fact. Farmers formerly got such a little return from their cows that it was considered hardly worth while to keep cows. But now they feel they are growing comparatively rich. The simple grant of $1,000 a year to the Dairymen's Association has led to a large improvement in the factories which are established. By having conventions to disseminate knowledge and by publishing the report, a work of great value is done. The reports are considered of great value, and the dissemination of the knowledge gives the farmers a disposition to adopt new methods. Any one who would have gone to the Richmond Convention a week or two ago and had seen the interest taken by the farmers, and had heard the determination that these conventions must continue, so that they could get further information upon their avocation, would not for a moment question the desirability of that expenditure, were it a hundred times what it is. The portion of the Government grant going to that convention was $1,000; the rest is provided by private energy, individual enthusiasm—and the result of the outlay is good.

By Mr. Fisher:

Q. Do you not think that the action of the Government of Quebec has been largely instrumental in bringing about that change?—It certainly has. It seems to me that the present condition of the dairy industry in Quebec, referred to a year ago by the Toronto *Globe*, is assuredly owing to the action of the Government in appropriating a certain amount—I think it was $5,000—in its interest. This impetus given by the assistance of the Government has led to the formation of the dairymen's association. This association has done a good work, and a work that is regarded as valuable to the Province. I have but one opinion about this, and I find that there is no well sustained opinion in the country, no general opinion opposed to this.

Q. Now, can you give us any idea of the action you would expect such a Bureau to take in regard to butter dairying especially? What would be your course of work?—I made a proposition before another Committee, and it is the outcome of my ex-

perience, of consultations with professors from both sides the line, of observations at the dairymen's conventions, and of conversations with the farmers. My proposition was that the Government establish a Bureau—a dairy-interest Bureau, if you like—in connection with the Department of Agriculture. Through this Bureau the details of Government action could be worked out as they could not be worked out in any other way that I can think of. There are many ways in which it might be worked out. A part of this proposition was that a grant might be made of $100, for instance, to each dairymen's association that might be formed with a minimum membership of say 100 persons, and an annual fee for membership of say 50 cents. The Bureau, having its properly qualified officers, lecturers, professors, or whatever you may call them, could supply a professor or lecturer to the annual meetings of these associations. The professor's expenses would be reduced to the minimum, because the conventions could be so arranged as to be held in regular order. The Government could also have an official shorthand reporter to attend each of the conventions and to prepare a report. Each one of the reports would contain most valuable matter. There might be repetition in them, but a digest of them, that is, of the reports of all the conventions in the Dominion, would be one of the most important and valuable works in connection with the dairy industry, and the branches of farming that are connected with it. It would be a most valuable report for dissemination throughout the Dominion. And the objection that might be urged, that they would not be read, is set aside by the fact that they would be sent to the members of the convention who had been at the convention, and who, having got interested in the subject, would look eagerly for the report of the meetings. I can conceive of no better way in which the experience and wants of the farmers could be drawn out and in which prompt discussions upon them by the professors could be obtained. Then the reports being circulated, the result would be so great that the expense would be in comparison a mere bagatelle. Another way in which the Government could help is by having model butter or cheese factories. The advantages of such factories are already recognized to such an extent that the Ontario Government has decided upon establishing one. If such a factory is good for Ontario it is certainly good for the other Provinces. But some of the Provinces—take, for instances, Prince Edward Island—cannot, if they would, go to the expense that Ontario can go to. Now, the Dominion Government could do the work once for all, for all the Provinces. The model factory—model dairy, if you like—would, in the first instance, be a place to which anyone wishing to start a factory, would go for information, to see the thing in actual working, and to study the most advanced methods in the world. Another thing—it would be an experimental work, keeping in advance of everything else. It would solve the different problems connected with making the milk into its several products, or it could send out lecturers and travelling dairies; the latter passing through different parts of the country would be very helpful. Now, private enterprise cannot do all this; it has quite enough to do outside of all this, and I think it too bad for such work to be left alone to private enterprise. If I may be permitted to speak of my own work, I may say that it has been a matter of private enterprise. I have worked for three years in this way for my own private purposes and objects, and while I have had no return direct, there has been a large result in the agitation of the question that has been good for the country. But that was not my object or my purpose. Is it fair, in order that I may succeed in my private enterprise, that I should have to do an amount of educational work and to prepare the way for others? I have tried to get capital associated with this object; capitalists admit that it is a good field and a desirable field; but they say the industry is in such a peculiar state, such a bad condition, and the farmers will not buy the appliances they ought to buy, because they have been swindled so much that they will not readily go into it. Now, is there not here a field for Government to do what private enterprise cannot be expected to do? Should not Government pave the way for private enterprise, by adopting some such means to improve the industry as I have indicated. Some people ask what would be the result of such work, but we cannot fully estimate it.

By the Chairman:

Q. What is the loss suffered hy the farmers on account of the inferior quality of the butter made in Canada?—I have estimated the loss at $5,000,000 annually, upon the basis that 50,000,000 pounds are produced every year. When you come to take all the conditions into account and consider what has been done for the sister industry —the cheese industry—the loss upon butter making must be something like $5,000,000 annually. But the 50,000,000 pounds does not represent the entire manufacture in the Dominion. I saw somewhere that it was 100,000,000. It is estimated that the production of butter in Ontario alone is 50,000,000 pounds. The Treasurer of the Province said, two years ago, that it was 50,000,000 pounds of bad butter. But I do not agree with that statement, in the strict sense. There is a good deal of our butter that is consumed fresh, and a large portion of it is good. It would not be good if it was salted, packed and shipped a distance, but so long as it is consumed fresh it is good butter, and serves all the essential purposes of good butter. Consequently, it will not do to say that, because nine-tenths of the butter that finds its way into the market is bad, nine-tenths of the butter produced is bad. So I modify that estimate and say that not 50,000,000 pounds of butter produced in Ontario is bad, but that 50,000,000 pounds of that produced by the whole Dominion is of inferior quality. And surely, if some estimate the inferior butter at 50,000,000 pounds for Ontario alone, I can safely base my estimate upon 50,000,000 pounds in the whole Dominion not being what it ought to be. In view of that, there can be no doubt that the pecuniary advantage of improving our production of butter will be not less than $5,000,000.

By Mr. Fisher:

Q. I do not suppose it is likely, if the whole product was improved in quality, that the price would increase in proportion. The people would get a better article, but I doubt that the price would increase in proportion to the quality?—No; but there is very much sold to-day at less than people would give for good butter. Then, again, if the butter were good the export of butter would be very much greater, the business would then be profitable, and the profit arising from the profitable production of butter would lead farmers to adopt better methods and to cheapen the cost of production. Thus, in the end, though the price of the butter might not be very much greater, the profit would be larger.

Q. It would also meet the competition of oleomargarine, which now competes with bad butter, but could not possibly compete with good butter?—Yes; that is another feature. I would say further, in connection with this subject of Government assistance, that on my way to London from Toronto, I met a leading member of the Ontario Legislature, a gentleman who has had an official position in the Dairymen's Association and is a large cheese manufacturer. Speaking of the recent Government action there and the good results that were already evident, he said: "Anything that the Government of Ontario can do in this direction certainly will be done." He then referred to some injury done in connection with wheat growing, by the rust, or insect, or something of that kind, of recent occurrence, and said: "Just think what an advantage it would have been to the Province to have had some light thrown upon that, so as to have averted the evil." Then, at the convention it was stated by the present President that it had been intimated to him by the Government of Ontario that the expenditure had been so satisfactory in its results that they could have whatever money they could use—"call upon us for more if you need it; we consider it money well expended." He gave that publicly to the convention. It was a sentiment that was applauded. I find many such evidences of the satisfactory results of the expenditure in this direction by Government.

Mr. JAMES FLETCHER, of Ottawa, Vice-President of the Entomological Society of Ontario, called and examined.

By the Chairman:

Q. What experience have you had with reference to the study of entomology, and especially as regards its connection with our agricultural interests?—I have been study-

ing Canadian entomology, especially the economic aspect of it, since I have been in Canada, that is, since 1874. Of course, the chief object of all entomologists, in a new country especially, and particularly in Canada, is to give our studies a practical turn, so that they may be of use to the community at large. We, having studied the science of entomology or the study which treats of insects and the injuries they commit on the crops, wish to make our labours as popular as possible, and to make them as well understood as possible by those people to whom they are of most interest. The farming community is spread over a very large tract of country and is in many respects the most important portion of the whole population. The great source of wealth in a country is the produce that is to be got from the soil. In fact the produce of the farm forms a very large and important part of the produce of any country. The least estimate we can put the value of the annual crops of Canada at is about $200,000,000. I have estimated this from the Census returns, and I think it is the very lowest figure we can put it at. Now, all our crops are simply decimated every year, at least 10 per cent. of them is lost. Many crops are half loss, and in some years others are not worth harvesting.

By Mr. Fisher:

Q. In consequence of insect ravages?—Yes; my remarks will all apply to the ravages by insects. During the past year or two a serious insect enemy has appeared in the clover crop—the clover seed midge (*Cecidomyia leguminicola*). Perhaps it is the most serious insect pest the farmer has, at the present time, to contend against. I notice in the replies to the question in the circular sent out by the Committee: "What crops and fruit products have suffered most, and from what insects or birds?" that some farmers say the whole of their clover crop was simply lost from this one insect. Now the loss to crops is caused, not by large and conspicuous insects, but by insects so small that they are not noticed; and I have no hesitation in saying that if you were to ask twenty of these farmers to what they attribute the loss, half of them would not know that the insect was at the root of the trouble. Some would say that the seed did not mature; some that it was the blight, and some that it was not a good season. But when we come to investigate the loss, we find that it is caused by this one insect. It is a small fly that lays an egg in the flower of the clover. This egg hatches into a small maggot which entirely consumes the seed. It is small and inconspicuous, and is not noticed except in its effects. It is insects of this kind that entomologists would be useful to point out. It is not the large insects that do the damage. For instance, the larva of the moth (*attacus cecropia*) that destroys our apple trees—the caterpillar, is from four to five inches in length; it is as large as your finger and very conspicuous indeed; it has never been injurious, because it is easily seen and destroyed. Besides, the instinct of the moth is such that it does not lay so many eggs on one tree that there is not sufficient foliage to feed them on. It is the inconspicuous insects—the insects that are not noticed that are most destructive. It is the same with the Hessian fly (*Cecidomyia destructor*) and the wheat midge (*Cecidomyia tritici*). The wheat midge, some years ago, destroyed in one year $8,000,000 worth of wheat in Canada. The Hessian fly destroys enormous quanties of wheat. The clover seed midge I was drawing your attention to just now, is doing great damage at present. The army worm is a more conspicious insect; but the chief reason it is so injurious is that it does not appear regularly. It may appear one year and sweep everything before it; then it does not appear for some years. Now, it is found by entomologists that the circumstances most advantageous to the production of large quantities of the army worm are a dry autumn and a damp season following, which produce a luxuriant growth of vegetation. Thus their *habitat*, or the place where the circumstances most advantageous to their growth and increase, is extended. These places are in low grounds or damp places. Now if these *habitats* are extended over the whole country by atmospheric circumstances, the moth migrates from its own special restricted *habitat*, and covers the whole country. Under favorable circumstances, it increases in enormous numbers and sweeps everything before it. One of the chief objects of the scientific student is not only to detect the moths or insects which

injure our crops, but to find out some remedy for them, the most economical remedy, and the best way of applying it. Perhaps this is not the place to mention it now, but the best remedy for the army worm has been found to be, to dig trenches. The worms are processional. They march in armies, devouring everything they come to. It has been found that by digging a trench about one foot deep, and putting in a poisonous substance, such as tar or coal oil, they fall into these trenches and do not get any further Now, then, permit me to say a word as to the feeling with regard to entomology. The object with which I took up the study, certainly began with the interest I took in the insects scientifically; but the economic interests, the interests in which the farmers and those engaged in cultivating the soil are concerned, are so absorbing that when anyone once takes up the study he will be induced to carry it on, with an eye to those interests, if for nothing else. At any rate, that is the case with entomologists I have been brought into contact with. You are all familiar with the name of Prof. Saunders, of London, of whose entomological work this is a copy. (Presenting the Chairman with a copy of Saunder's "Insects Injurious to Fruits.") He began studying entomology some years ago. For many years he has devoted a great part of his time to studying the insects which are injuring our crops and particularly our fruits. He is not, as some of us are, only a scientific student; he is engaged in large fruit-growing operations; also, in agricultural operations, and is, besides, eminent as a chemist. He has been engaged in the garden, the fruit garden, the orchard and the field; and has paid particular attention to the injurious insects. In Western Canada, there are, I think, more species—different kinds of insects—than we have here. The climate is more equable and the insects develop more readily there than here. But for all that, every part of Canada has its special injurious insects and it is a necessity that every farmer should pay some attention to them. One of the most remarkable things is the ignorance on the part of the farmers on this subject. There is no class of the community in Canada so interested in these insects as the agricultural class. In making such inquiries as it has been possible for me to make—and the same feature is noticeable in the answers to the circulars sent out by the Committee—I have found a most remarkable inconsistency among the farmers on this subject. In some of the answers to the circulars you will find them saying that although they have lost the whole of certain crops from insect ravages, yet they do not consider that a state entomologist will be of any use to them; and the question which calls forth this opinion expressly states that the duties of the entomologist shall be to give information concerning insects, injurious and beneficial. There is no doubt of this, that unless one makes a scientific study of these insects any information he may give is utterly useless. The insect is not really so injurious in its perfect state. It is in its embrionic states that it is most injurious, one of the chief sources of danger being that we do not notice it. For instance, the Colorado potato beetle—although that insect eats the foliage of the potato, the chief injury that is done to the pototo is by the larva. It is in the stages in which they are not recognized that the insects do the most damage. And it is only the entomologist, who will study the insects closely, and give a great amount of attention and time to them, that can detect them in their different stages, and recommend and apply the remedies for them. The economic entomologist should first study the foe he has to fight; for if he does not know who and what his foe is, he cannot fight him We may say, in general terms, that insects pass through four stages; the egg, the larva, the pupa or quiet stage, and last of all, the perfect insect. The egg, of course, is the source from which the young insect comes. Then comes the active stage, in which it consumes and locks up a store of nourishment. Then comes the pupa or resting stage, during which there is very seldom any food taken. In the *levidoptera* -the moths and butterflies, those which have conspicious wings, and in the *coleoptera*, the beetles with hard sheathed wings, there is a quiet resting stage. Then follows the perfect insect, the chief object of which is to perpetuate the species. There are very few classes of insects which do harm to crops in their perfect states. It is in their larval state that we have to fight them. The economic entomologist should first learn the condition of his enemy and then bend his efforts to discover

the most economical and convenient remedy that can be applied. Paris green is now one of the principal remedies used. It was discovered as an insecticide by an entomologist in the United States, about 1869. Paris green is a specific against all insects. It is poisonous to everything; and the only objection to it is that this same poisonous quality might turn against ourselves. But with care, there need be no danger at all. It is a combination of arsenic and copper, and is known to chemists as an arseniate of copper. In its pure state it contains about 58 per cent. of arsenic. Of course, in using any remedy we should know what we are using. If it is pure it should contain 58 per cent. of arsenic; if it is not pure you cannot apply it with the same results, for if it contains only half the amount of arsenic, the ordinary application will not be efficacious.

By Mr. Landry:

Q Do you mean the arsenic itself or the arseniate?—The arseniate. The Paris green, as I was saying, should be pure, or else you cannot rely upon its effects. Now, in using it, we have found it convenient, in fact necessary, to mix it with certain substances that we call diluents. The most advantageous of these is, perhaps, common flour. It is advantageous in this manner. The poison is applied in two different ways, both wet and dry. The dry mixture is considered to be the better by some. It has its advantages and its disadvantages. The particles of flour being very small and the granules of this green poison being very small, too, they mix easily; and thus the volume is very much increased, while the amount of the poison which falls on the plant is not sufficient, if properly diluted, to injure the plant. If the poison is put on too strong it will destroy the foliage and do as much injury to the plant as the insect will. Of course, everyone connected with agriculture will know of what importance leaves are to the plant. The functions performed by leaves are in general terms, to breathe from the air a certain part of the food of the plant; they act in almost the same way as lungs in animals. They breathe from the air certain gases that are mixed with other certain gases taken in by the roots in the shape of water, and from these the substance of the plant is built up.

Q. Especially the underneath part?—Yes; certainly. There are ducts through which the gases are taken into the body of the plant, and are there assimilated; then certain gases are returned again to the atmosphere, as, for instance, oxygen. Vegetation is the only means through which pure oxygen is produced in nature. The beautiful balance kept up in nature between vegetation and animal life is a matter of wonder and admiration to every one who examines it. Plants breathing the air inhale carbonic dioxide a poisonous gas formed by animals in the process of breathing. This poisonous gas is the chief source of growth to the plant. So that the plant breathes the poisonous gas and exhales oxygen which the animal requires, and which the animal returns again to the air, charged with the poisonous gas which the plant needs. But we were speaking of the diluent for Paris green, and I mentioned flour. I have said that flour is the most advantageous to use for this reason it mixes readily with this poison. But in addition to this, when it is distributed over the plant it adheres better than some of the other diluents, forming a paste when moistened either by the dew or rain. The poison then remains for a longer time on the plant. This is one of the chief arguments in favor of the liquid mode of applying this poison. It remains, until the flour dries, in a sort of light coating over the whole plant. This poison—arsenic—takes a long time to lose its property. In fact, it is only after some months, when it goes into the soil and is acted upon by other chemicals that it is rendered harmless. The best results have been obtained by the use of flour in all parts of Canada, because it adheres better than other diluents—and more than that, it is more readily eaten by the insects. For instance, plaster of Paris, which can be very finely pulverized, has been used; but it is not so good as flour, as it is not eaten so readily by the insects. It is true the plaster of Paris has certain fertilizing effects upon the plant; but these are very small. And then the sole object of placing the poison there, is that the insects may eat it. A very useful mixture is one of Paris green and twenty of flour. Plaster of Paris is less expensive than flour, and is slightly fertilizing. In its use you can take fifty pounds of it to one of Paris green.

By Mr. Fisher:

Q. Seventy-five pounds are used?—In using 50 pounds I have found no injury to the foliage. I have no doubt it may be increased up to 100, and with the young larvæ, I have no doubt it may be increased up to 150 or 200; but then it requires a great deal of knowledge of the habits of the insects, and careful watching to know the exact time to apply it. Of course, all insects are much more delicate when they are young. I have thought that, perhaps, the most injurious insect to the apple in Canada, after the codling moth, is the oyster shell bark louse. (*Aspidiotus conchiformis.*) The reason for this is because it is so inconspicuous that it is not noticed. Among fruit growers and those who have orchards it often passes undetected. There is hardly an orchard around Ottawa—of course, this is not a good fruit growing country, with the exception of grapes—where you cannot find the trees dreadfully covered with this oyster shell bark louse. The insect is so small that unless you have some knowledge of insects you do not recognize it as an insect at all. It belongs to the *Hemiptera.* The male is a little winged fly, but the female is simply a scale which covers a large number of eggs. Very little is known of these insects; but Prof. Comstock, when State Entomologist of the United States, gave a great deal of study to them, and published a very able report upon them. His studies are particularly thorough and valuable. Moreover, our own Mr. Saunders has paid a great deal of attention to them. The theory concerning these insects is that after fertilization the body of the female gradually dries up and leaves simply the eggs remaining beneath a scale, of which there are a great number. The skin or shell then remains as a cover to the eggs, which are thus protected during the winter. Now, it is very hard to apply any remedy that will penetrate through that skin. It was considered, until Prof. Comstock examined the matter, that it was, in fact, impossible to get any substance to penetrate through this scale. In the early spring the end of the shell is pushed up, and the young plant lice lying hidden there, emerge. They then move up towards the young twigs or shoots, and there they penetrate the bark with their beaks and suck out the juice from the stem. The insects go through their regular cycles of existence. They increase enormously, the proportion of females being much larger than that of the males. They cover up the whole of the young growth; they suck the sap from the trees, and it is thus injury is done. The chief source of that injury is as before, that they are not recognized, and consequently left alone. It is satisfactory to know that Prof. Comstock, after making many experiments, has found that the best remedy that can be applied is what is known as a "soap wash" made of common soap. By using the word "best," I mean not the most efficacious, exactly, but the remedy which is most at hand, and the most convenient for every one to use. The soap wash should be thrown on the plants during the month of June, when the insects are tender and are easily killed. Prof. Riley, who has done a great deal for economic entomology and whose writings are of the highest value—in fact, this gentleman has done, perhaps, more than any one else in the United States in investigating injurious insects—found that coal oil, in its different forms, may be used very advantagously in fighting these insects. Of course, the oil will not mix with water easily; but he has found, after many experiments, that an emulsion may be made by mixing the coal oil with milk, and that this, when once mixed in the proper porportions will to a certain degree, mix with water. In this way he has found that it can be applied to the plants in such quantities as not to injure the vegetation, yet to be strong enough to penetrate the scale and kill the insects. It is only a few years since this was discovered. If it be applied, I have no doubt at all that in a few years we shall be able to combat the oyster shell bark louse successfully.

By Mr. Landry:

Q. The soap wash, I suppose, acts upon the caterpillars?—Yes: the alkali in the soap will destroy nearly all insect enemies. The soap wash, as I said, is the most convenient. A cold, saturated solution of washing soda, with soft soap, of the consistency of paint, applied to fruit trees, will prevent insects depositing their eggs on the bark. The apple trees suffer from borers, that bore into the bark and feed upon the vital portion of the tree. The borers deposit their eggs upon the bark; the

young larvæ penetrate the bark and feed upon the cambium layer or sap-wood of the tree. In some instances they girdle the tree, and so prevent the sap, and the tree dies. Now, to prevent these insects from laying their eggs on the bark, one of these deterrents must be used, and the soap wash is the most convenient and useful. If the soap wash is mixed with soda in proper proportions, it forms a coating for the tree which is not easily washed off by the rain, and which will prevent insects from depositing their eggs there. The inconspicuous insects are the chief source of our injuries, and it is only the entomologist, who is led to study them and know them in all their different stages, that detects them. It is all very well to say that any one can apply Paris green to his potatoes. Yes; but who was it that found it out? Who discovered that it was the most convenient poison to be used? The Entomologis, after much study

By the Chairman:

Q. Who discovered the use of it?—I know when it was discovered, but I do not know the actual name of the discoverer.

Q. Was it not Prof. Riley?—I think not himself. I think it was discovered as an insect poison in 1869, in Illinois. The first mention of it was in a newspaper as being used by some one in Illinois. Prof. Riley then took it up. But it was an entomologist who found it out, after using a great many other substances. There is another composition that has arsenic in it, known by the name of London purple. Many people are in favonr of it, but I think, on the whole, Paris green is safer and surer. It does not do to play experiments, when you know a certain substance is a remedy, in such an important matter as this. This London purple has been found useful; it is a waste product produced in the manufacture of analyne dyes. It is a composition of arsenic and lime, and is known as an arseniate of lime. It is much cheaper, because it is a waste product, and should be produced at a very little above the cost of carriage, because, being a waste product, it requires a great expenditure on the part of the manufacturer of analyne dyes to get rid of it. Prof. Riley, in the States, praises this substance very much. He says that its cost, contrasting it with Paris green, per acre of cotton, should be only 5 cents instead of $1. It is possible that this may be too favourable a view. But, at any rate, it is a useful poison. Prof. Saunders, of London, who is certainly one of the most thorough entomologists on this continent, and is recognized as one of the best men we have, being also a practical chemist, has thoroughly investigated the matter, and he says he does not think it would be safe to use London purple as the chief remedy. Being a waste product, the proportion of arsenic or poisonous property in it is irregular, and is not to be relied upon. The cost of Paris green, to be safe, should be 50 cents per pound.

By the Chariman:

Q. What loss do you estimate is caused annually by insect ravages?—Taking the average annual produce of Canada at only $200,000,000, which is the lowest possible estimate, I think that the lowest estimate we can put the injury by insects at, taking the average—and it is far below what is actually the case—is $20,000,000.

Q. Would it be advisable to have a Government entomologist, and give your reasons?—There a great many. I believe that a Government entomologist would be a most useful officer of the State. He could give most useful information. But whether it would be wise to advise the appointment of a State entomologist at the present time or not, I do not know. It would require a certain amount of expenditure, which, perhaps, the Government might not be inclined to go to just now. That such an officer would be useful, there is not the shadow of a doubt. Let us look at it in this way. The United States Government is certainly not a Government to waste money upon a useless officer, but the United States has done more to support the service of entomology, and the study of economic entomology than any other country. If the expenditure thus entailed were useless, the United States would not be the country to enter upon it. Congress gives large sums every year to the entomological branch of their Department of Agricultural, and many of the individual States have also their State entomoligists. Now, with reference to the appointment of a State entomologist, I do not know that I can quite advise that step just now

There are only one or two men in Canada that would be fit to take that post and who would produce, in the first report, such results as would convince the whole country, and particularly the farmers, that the expenditure involved was justifiable. The man most capable is Mr. Saunders, of London. There is Mr. Bethune, of Port Hope, also a very eminent entomologist, but we all consider that Mr. Saunders is far ahead of everybody else here. He is, and has been for some years, the President of the Entomological Society of Ontario—of which I have the honor to be Vice-President.

By Mr. Landry:

Q. Does he live at London or Toronto?—He lives in London, Ontario. I believe if he could be induced to take that position he would be able to make such a report that the farming community, in general, would be persuaded and convinced that the expenditure incurred in entomological investigations would be a good one.

Q. What suggestion could you make; what action should the Government take? —We have now in the Department of Agriculture, as its Deputy Minister, Dr. Taché, who is a man of great learning and intelligence. He is read in entomological matters and has published a very valuable pamphlet on the potato beetle. It is the best work we have on that insect. Unluckily, it has only appeared in French; possibly it will appear in English also, in which case it would be of very great value to the whole farming community. Certainly, the potato bug is now pretty well in hand, by the advice of the entomologist being followed, and we should not fear any more of it as a serious pest. But I think, as I say, we have already existing a Department of Agriculture, with a man at the head of it fitted to carry on, or to direct, entomological studies. I believe there is no branch of science of so much direct use to the country at large as these entomological studies, because insects are so numerous and because they attack every plant we wish to grow. I believe the estimate has been made that every plant has an average of six insect enemies. This is stated in the report by Dr. Lintner, the State entomologist of New York State, in his most valuable first report on injurious insects in New York. I believe there is more information in that report than in any other work on insects, of the same size. Moreover, he gives certain preliminary chapters, in which he deals with primary subjects. He gives the importance of entomological study; then he gives the extent of insect depredations, and then a list of insects. I will just give you two or three facts, well authenticated, which he has collected in this book. He states that in 1857, speaking of the wheatmidge, it extended its ravages over a large portion of New York. In 1854 the loss was 15,000,000 bushels in consequence of its ravages. In 1857 it exceeded that. In Canada that year it destroyed 8,000,000 bushels. Now, if we put wheat at $1 per bushel, then you see there was a loss of $8,000,000. There is no doubt very little information could be got as to the exact loss at that time, but if a true return could have been secured it would have been found to be in excess of that.

Q. Do you think the Government should try to have a report on injurious insects and distribute it among the farmers?—I do, Sir. We have a Bureau of Agriculture already existing. We have a man who is fit to direct entomological studies at the head of it, and to begin with, it has been thought that appointing a State entomologist would require too large an expenditure, if a certain small amount of money were put in the hands of the Deputy Minister of Agriculture he might distribute it among already existing societies, with good results. We have in Canada four or five societies. Starting from the west we have the society which is doing certainly more work than any other society in Canada—the Entomological Society, of Ontario, This society is liberally subsidized by the Ontario Government, and makes to them every year a report, which is published in the Agricultural and Arts Report. Then we have the Toronto Natural History Society, with good entomologists belonging to it. We have here at Ottawa the Ottawa Field Naturalists' Club, a very active club. Then going to Montreal, a branch of the Entomological Society of Ontario, and the Montreal Natural History Society, with Mr. W. Couper, an active entomologist, as member of both. In Quebec we have the Quebec Literary and Scientific Society;

we have also there one of the leading entomologists in Canana, L'Abbé Provencher, a man who has worked hard from year to year in the interest of the science. His paper, the *Naturaliste Canadien*, he has published at great loss. From his small stipend as a priest he has taken as large an amount as possible; he has only saved enough to live on, and the rest of his money has gone into his paper. Unluckily, the Quebec Legislature has taken away the small grant they gave him, and the paper has had to come to an end. The Province of Quebec has also suffered great loss by the stoppage of L'Abbé Provencher's work. But to proceed, at Halifax and St. John they have already existing Natural History Societies. These societies, I am sure, with a very small assistance from the Government—and, in fact, they would without any assistance at all—would make a report upon those insects in their districts that may be found to be injurious. If a small grant were given to these societies, it would be a necessity for them to do something. If a small amount were given to them, if only with the object of purchasing apparatus, it would be a help, for, of course, apparatus is necessary, and their studies require a great deal of time, while the information must be gathered from all parts. I believe that if a certain small amount were placed in the hands of the Deputy Minister of Agriculture, he might be put in the same position as the Commissioner of Agriculture in the United States. There Prof. Riley is the entomologist, but his department is only a branch of the Bureau, and the Commissioner of Agriculture exercises control over it. Dr. Taché might direct the small subsidies to be given to the Societies, and require them to forward to him their report. These could then be consolidated into one report from his Department, upon injurious insects and the remedies for them.

Q. Do you think farmers in the United States have derived great advantages from the appointment of entomologists ?—I do, indeed ; particularly with reference te the potato bug and this bug will be stamped out, so far as Ontario is concerned, if the advice given by entomologists is carried out. Another insect that does great injury and destroys millions of dollars of produce is what is known by the name of the chinch bug. It is one of the most injurious of its order, namely, the *hemiptera* or true bugs. The bugs of this order are nearly all recognizable by the disgusting odor which they emit when they are touched or handled. The chinch bug is one of the most injurious. It destroys wheat to the extent of millions of dollars. I think it was the New York *Sun* that said if the United States were to spend $5,000,000 in fighting one particular insect, which was mentioned, it would be the cheapest and most economical expenditure they ever made.

Q. You think the Government here should do something to encourage the study of entomology ?—I do. I think there is nothing of more importance to those engaged in cultivating the soil than that science.

Q. You think it would decrease the ravages committed by insects ?—I do. I think an entomologist would study the different stages of an insect, and find out the stage in which it is most vulnerable and the remedies which could be applied with the greatest success. Then there is another thing, one of the greatest disadvantages we have in this country, is that we cannot collect information. Nearly all the entomologists we have in Canada are engaged in other pursuits ; they have their own occupations, and cannot give the time to collect information. I believe if the system followed in the United States were adopted, this difficulty would be overcome. There they issue a circular, and send it broadcast over the whole country, putting it in such language that every farmer can understand it. The question is asked : Do your crops suffer? If so, what crops, and in what manner ? Have you noticed any insects ? If you have not noticed them, suggest what the cause of the injury may be. Then they reply, giving a statement of the facts as they exist in their district. Of course there may be inconsistencies in their replies. I find inconsistencies in some answers to your circular. Some farmers say that a State entomologist would not be of advantage ; yet, you will find those very farmers reporting that the whole of their clover crop has been destroyed by the clover midge. There is an inconsistency there. The two statements are equivalent to saying that the man who would tell them how to prevent the loss of their crops is not necessary.

The Committee adojurned.

OTTAWA, 8th March, 1884.

The Committee met. Mr. Gigault in the chair.)

Prof. P. D. PENHALLOW, of McGill College, Montreal, called and examined.

By the Chairman:

Q. What experience have you in the working of experimental stations?—For the last three years I have been more or less directly connected with experimental stations. Previously to that time, I had been engaged in agricultural work, more or less directly, either in the line of agricultural education or agricultural experimentation. In 1876 I went to Japan as Professor of Botany and Chemistry in the Imperial College of Agriculture, and was there four years in that capacity. On my return to America in 1880, I was placed in charge of the scientific work of the private experimental station in New York, known as the Houghton Farm Experiment Station. I was in charge of that work until I came to Montreal, in September last, where I now hold the Chair of Botany in McGill University.

Q. Can you describe the working of the principal experiment stations to which you were attached?—The experiment station to which I was attached, as a private institution, was of the nature of a large model farm, chiefly devoted, as a farm is, to the raising of produce and cattle. The introduction of the experiment department, which was the experiment station proper, was conducted with reference to the acquisition of scientific facts which might be afterwards employed and applied practically to the wants of the farm. The work which that station undertook was chiefly in the direction of fruit culture, and in that line more particularly, investigations were made into the diseases of fruit, because we were in the centre of the great fruit section, south-eastern New York. In addition to these experiments there were experiments conducted in relation to the general laws of vegetable physiology, the relations of soil temperature to plant growth, and the relation of certain fertilizers to plant growth. That is, perhaps, a general outline of the work carried on there.

Q. Where is that farm?—At Mountainville, N.Y.

By Mr. Fisher:

Q. It was not a State farm?—No; a private enterprise.

By the Chairman:

Q. What have you to say regarding the experiment stations of Japan?—In Japan they have no true experiment stations, although they have large experiment farms, which have been established with direct reference to the importation and testing of improved farm machinery, farm stock, and fruit and forest trees. These farms have been established chiefly within the last ten years, and almost entirely in the northern portion of the Empire, in the Island of Yeddo, where they have desired to make special efforts in the development of agricultural resources. There have been one or two farms established in the main island, in Tokio and vicinity, but they are more of the nature of farms subordinate to those in the north. In the north there are at least four principal farms of that character, which have all been established within the last ten years. Some of them are of very large size. One of the farms is connected directly with the Agricultural College at Sapporo, and is under the immediate control of the professor of agriculture, the relation there being precisely that which obtains here between the farm and the college in our agricultural institutions. The other farms are entirely and directly under Government management. They are under Government officials; and they have been endowed by the Government, or at least they have received a certain sum annually, which varies somewhat according to the location of the farm. A farm which was connected with the college had an annual grant of $20,000 for its support. The farm nearest to it received $40,000 annually. The largest farm of all, situated in the southern part of the island, near Hakodadi, received an annual allowance of $60,000. The works these farms have carried on have been, in the first place, the importation of blooded stock, horses, sheep, and cattle, chiefly from the United States, from which they have bred directly, or with which they have crossed their native stock, with a view directly to improve what they have already. One of their farms is

especially devoted to the improvement of their native breed of horses. They have had there, for a long while, perhaps for several centuries, a very inferior grade of horse, which has been allowed to run wild in the northern island and to breed pretty much as it would. They are now improving that breed by crossing it with Kentucky stock or Arabian stock. Then another very important work which these farms have accomplished has been in the direction of importing fruits and grasses. One of the most important perhaps, is the importation of sweet forage plants. The country there is naturally devoid of sweet grasses suitable as food for cattle. It has been one of their chief objects to introduce these grasses, as a preliminary to stock-raising. Then they have imported large quantities of fruit trees. The number of desirable fruits known to Japan, before recent foreign intercourse, was exceedingly limited, and confined almost entirely to the orange and persimmon, a few grapes and one or two kinds of pears of very inferior quality, and inferior peaches. They had none of the highly developed varieties of fruit which we deem so desirable, in the way of grapes and pears and apples. Their efforts have been directed, within the last few years, to the importation of these, and the testing of them, with a view to their special adaptation to their climate. In 1871 or 1872, when this movement was first established, they established a large garden at Tokio, for the testing of imported fruit trees, and from that centre they have distributed all our desirable fruits, including plums and cherries. Throughout the northern island of Yeddo there are now numerous, and in some cases large orchards, which have been established in this way. Not only that, but they have developed a large industry in vineyards and hop culture. There we have a very direct and valuable outcome of the work which can be performed by these experiment stations, or more properly, in this case, trial grounds. This is hardly the work of experiment stations, but more the work of testing grounds.

Q. So you believe that these experiment or trial grounds have helped a great deal to improve the condition of agriculture in Japan?—Vastly.

By Mr. Foster:

Q. Has there been any income from those grounds?—The time which has elapsed since the movement was first undertaken has not been sufficient to enable us to judge as to what will be the pecuniary results. Of course there has been some income, but the principal orchards are only five years old, and the vineyards, when I came away in 1880, were just coming into bearing, so that though they had five hundred acres under crop at that time, it was impossible to tell just what the result would be. The principal object in planting these large vineyards under Government control, was with a view to making wine, but of course it is a question whether their climate is adapted to the manufacture of wine.

Q. But they have that object in view?—Yes.

By Mr. Fisher:

Q. I suppose they distribute these plants and trees gratuitously?—Yes; their object being to directly encourage the people in the cultivation of those improved varieties.

Q. Then the stations were as much propagating grounds as experiment stations?—Yes.

By the Chairman:

Q. Do the Japanese seem to be satisfied with the results obtained from these experiment stations?—I think they do. I may say that another outcome of these model farms has been the introduction of improved agricultural machinery from abroad and the fostering of native industry. The Japanese implements, like most implements in Oriental countries, were formerly of a very crude form. The use of the plough and the harrow was comparatively unknown. The plough was used to a very limited extent and the harrow not at all. The spade was not used, and the hoe was entirely unknown. These implements have been introduced, and the result of introducing foreign agricultural machinery, including reaping machines, mowers, threshers and all those implements which would apply to the operation of large farms, has been the building up of various establishments where these implements

are now manufactured on a large scale. They have not arrived at the perfection we have reached on this side of the water; still they are making very good implements and have built up a very important native industry.

Q. Have you anything to say about the experiment stations in Germany? Do you know how many there are there?—Perhaps the best way I can answer that would be to give you a brief sketch of the institutions there, the origin of their establishments and the number. The first movement which occurred in Germany leading to the establishment of their experiment stations was brought about through the efforts of the farmers themselves. Up till 1850 there were no institutions which were qualified to carry on investigations of a scientific character which could be applied to agriculture. The farmers of certain portions of Germany began to realize that their future success depended very largely upon more exact knowledge, as obtained from scientific research. So, in 1852, in Saxony, a local Farmers Club organized, by their own efforts and at their own expense, a small experimental station. They placed that in the hands of a University graduate; I believe it was Dr. Wood, who has since given us such valuable results in his scientific work. In two years time that station had so thoroughly demonstrated its usefulness and its importance, that the Government recognized it, and not only recognized it, but extended to it every important pecuniary support. The work of that station, which was then extended, came to be recognized as of great importance to the country at large. Since then, as the results of that early movement, there have been established, within the last thirty years, over eighty of these stations. Nearly all of them receive at least a measure of support from the Government, although many of them are still largely supported by private subscriptions or local societies. I think it is exceedingly significant, as showing the importance and the value of these stations, that the farmers themselves should initiate the movement, and that it should come from them rather than from the Government.

By Mr. Foster:

Q. Does the Government exercise any supervision over the farms they aid?—These experiment stations, as I understand it, are centralized, to a certain extent, under one head, who is really the Government officer in charge of the entire system, and the results are largely elaborated through that central medium, although each station publishes, to a certain extent, independent reports.

Q. How does each institution keep up its running expenses? How are these provided for?—A large part of the running expenses would be made by fees which come in from outsiders for work performed. For instance, if they are especially engaged in the analysis of fertilizers or soils, the fee which would be charged for that work would be sufficient to cover the actual expenses, and so the running expenses wouldbe largely made. If it were not for that, the endowment which these institutions now receive would, in many cases, be inadequate, because the amount of money appropriated to them ranges from a few hundred dollars only, up to several thousands—I believe $10,000 is the highest annual grant—the amount of money of course depending upon the work to be performed and the number of assistants and directors requisite for its execution.

By the Chairman:

Q. Do you know what the annual running expenses of these experiment stations are, and what aid is given to each by the German Government?—I could not say exactly; but perhaps the allowance which they receive would not be so applicable in meeting the requirements of stations here, as would the grants to stations in the United States.

Q. Is agriculture in a very advanced condition in Germany?—So far as I know, it is as advanced, if not more advanced, than in any country in the world, and this is largely the direct result of the work of these stations. These stations have given material which is not only of the highest scientific value, but of the highest value, in the direct promotion of agriculture as a science; indeed we can attribute to this work almost all the exact knowledge we have at the present time concerning the careful breeding, management and feeding of stock, the growth and nutrition of

plants, the special requirements of plants, the adaptation of plants to soil, the sources of plant food, and other questions of a similar character, which are exceedingly numerous.

By Mr Fisher:

Q. As a rule, I believe each one of the agricultural stations in Germany takes up a specialty and works it out alone?—That is the system upon which they are organized. In order that no station shall repeat the work which has been done by any other, each station has a special line of work. Out of the eighty stations they have, there would be, perhaps, half a dozen—I cannot give the precise number—devoted to each subject. Half a dozen would be devoted to the study of the distribution of forest trees, the special study of the diseases, weed and vegetable, which attack them, and the special methods which may be employed for preserving the forests against their ravages. Other stations are devoted entirely to the study of fruit trees, not only with reference to their desirability, but their adaptation to climates and the diseases to which they are subject—a question which, at the present time, is an exceedingly important one and is likely to become much more important in the near future than it is now. Others are devoted entirely to the care, management and feeding of stock, and to stock-breeding. Others are devoted to the analyses of fertilizers, and to soil analyses so that is the way the work is divided up. Men of special qualifications can be put in charge of these stations, and they can bring out the best quality of work, which would not be possible if all these subjects were combined in one station.

Q. Is there any special Bureau which collects and systematizes the reports of these different stations and publishes them in one volume?—I cannot say exactly about that, but it is my impression that the work is centralized in a Bureau. It is more or less centralized under the control of one Government officer; and it is my impression that it is centralized in a Bureau—a Department of Agriculture.

By Mr. Foster:

Q. Do you know by what methods the knowledge gained is disseminated?—By means of annual reports, entitled Reports of the Experiment Stations. Those reports embrace only the most important portion of the work done; they embrace that which may be regarded as established. In other words, it includes what would be the foundation of laws on different subjects. Aside from those reports, a very large amount of information is distributed also through the medium of bulletins, which are issued at frequent intervals, as material is collected and occasion may demand. But the material which goes into these bulletins is carefully regulated and nothing is allowed to go into them which should more properly go into the report at the close of the season. The material which goes into the bulletins would be more in the nature of information to meet immediate requirements, as, for instance, the analysis of a given fertilizer, the analysis of a given soil, and such other things as the farmer would require immediate information about. Nothing is allowed to go into them beyond that

By Mr. Bain:

Q. Do they allow any students at these stations, or is their whole work done through reports?—Their work is done through their reports. They have students, in a sense; that is, they have students as assistants; but they do not undertake any educational work, properly speaking.

Q. Do they systematically take parties in training as assistants or only just casually?—Only casually; they depend upon men who have already received training.

Q. And their reports are supposed to be the only means by which they communicate the information they obtain?—Yes.

By Mr. Fisher:

Q. There are agricultural colleges in Germany, are there not? Is there not one at Hoenheim?—Yes; they have agricultural schools in Germany which perform the same functions as agricultural schools in the United States; and from these no doubt, they derive many of their assistants in the work of the stations; but they also look to the German Universities for men who have received a higher education in technical science.

By the Chairman:

Q. Will you tell us what you know about the working of the Experimental Garden at Washington, or the working of the Bureau of Agriculture there, and will you tell us as to the usefulness of these undertakings?—So far as I am acquainted with the Department at Washington, I think the work of that Department embraces the testing of plants and seeds at Washington, and the dissemination of seeds throughout the country. Within recent years its work has also embraced such important considerations as the development of the sorghum industry, the beet sugar industry, and productions of a similar nature. Investigations under the supervision of the Department of Agriculture have also been undertaken as to the diseases of cattle, and as to the ravages of insects and the best means that might be adopted for their prevention.

Q. Do you believe the present condition of the sorghum industry in the United States is due to the action of the American Government?—I think it is very largely. I think the interest manifested in it of recent years is very largely due to the encouragement of the Agricultural Department at Washington. But the industry, as at present carried on as a successful industry, is in the hands of private parties. I think there are at the present time in the west two factories which successfully manufacture sorghum sugar. One of them, I believe, is in Illinois. At present the industry is in its infancy, and it is a question how quickly it will become of national importance, because difficulties which have been encountered in properly extracting sugar from the sorghum have but just been overcome, and these have not been overcome so fully as to encourage parties in undertaking the cultivation of sorghum and the manufacture of its sugar upon a large scale.

Q. Do you know if the Government chemist at Washington has made any special studies regarding sorghum sugar and the way of extracting it from the cane?—The present chemist has made some investigations in that direction, but the investigations which were made were chiefly conducted by his predecessor, Dr. Collier, who carried on experiments, both in the field, growing different varieties of sorghum, and in the laboratory, testing them, for a number of years; and the knowledge we have concerning the methods to be employed is chiefly due to him.

Q. What do you think of the distribution of seeds from the Bureau of Agriculture in Washington?—I think that the work they have performed in past years, and what they are performing to some extent now, should more properly be left in the hands of private parties. So far as the results of their operations are concerned, I can say nothing decisive; but it seems to me, that the distribution of seeds by the Government Bureau is not desirable. The distribution of seeds should be left in the hands of private parties; but the business should be supervised and controlled by the Government, precisely as we now control in the States the fertilizer business. The seeds that have been sent out by the Department of Agriculture in Washington, in former years, have been notoriously bad. They were scattered broadcast over the country, and they did no material good. Men would receive them and lay them by on their shelves and purchase seeds from a reliable dealer. That has been the general experience throughout the country; and it seems to me that the only way to have seeds properly distributed is to encourage private dealers to sell a good quality of seeds. By a Bureau of Agriculture, or a special experiment station, if you have one, let the distribution be controlled. Insist upon it, that the seedsmen sell seeds of good quality, seeds that are not contaminated with weed seeds. Insist upon it, that there be no deterioration in the seeds, and that there be a proper percentage of vitality in them; in other words, that they be sufficiently fresh.

By Mr. Foster:

Q. How would you propose to do that?—By having the seeds inspected at such times as may be deemed necessary, by authorized inspectors. Let the inspector collect his samples in such a way as may be deemed best, and let those samples be tested. In the United States, at the present time, a great many of the most prominent seedsmen test their own seeds. They have their own specially employed seed tester, who devotes his time to that work. Upon those men we can rely for good seed. But

there are many other seed dealers who do not have their seeds tested in that way, and who would perhaps be willing to flood the market with spurious articles, and it is these men who should be under control.

Q. You would inspect only the wholesale seed?—The wholesale seed.

By Mr. Orton:

Q. And I suppose your idea is that the Government should have a seed tester, and that he should furnish the seedsmen with a certificate when the test is successful?—Yes.

By Mr. Fisher:

Q. Some such law as that of Mr. Massue's, in regard to agricultural fertilizers might, in your opinion, be applied to seeds; of course the possession of the certificate would be a great advantage to the seedsmen?—The Germans have a somewhat similar system now, which has been in force for a number of years, and their seed testing apparatus is being introduced into the United States for the same purpose, although there is as yet no Government control of the business.

Q. Might not the retail dealers sell deteriorated seed notwithstanding the test, unless we had some law to check them?—Not if the wholesale dealers put their seed up in packages. If the seed is put up in packages it should not suffer.

By the Chairman:

Q. Do the American farmers seem to be satisfied with the working of the Bureau of Agriculture at Washington?—I do not think they are wholly satisfied with it, from what I can learn. One great difficulty which they complain of is that the Bureau of Agriculture at Washington is too much controlled by policical influence. A Bureau of that kind, to be of great value to the farmers at large, must be, so far as its scientific work is concerned, controlled by men of proper scientific qualifications, who will be entirely removed from political influence. Then it will exert a beneficial influence, but not otherwise.

Q. Do you think the farmers would be in favor of doing away with the Bureau?—I do not think they would complain very much, although the work which has been done during the last few years in the direction of preventing the spread of diseases of cattle has encouraged the farmers to entertain hopes that in the future it might render much more valuable services to them.

By Mr. Foster:

Q. The system is largely unpopular, if it is unpopular through defects in its management?—That is where the difficulty lies.

By the Chairman:

You think it would be useful if properly managed?—I think such a Bureau is of great value. It is an important Bureau to have, but I think it must be properly managed.

By Mr. Orton:

Q. Is it possible to remove the Bureau of Agriculture from political influence altogether?—I think the scientific work might be removed. Yes; I think it would be perfectly possible to select for such a Department as that at Washington, a man of sufficiently broad scientific attainments to take charge of the system as a whole. Put him into the office and let him feel that his position is not dependent upon the movements of politics. I think that might be done. Then there might be, in addition to that, a Minister of Agricultural, but he need not have the immediate control of the scientific work.

Q. Would you then have the head of that Bureau appointed outside of the Government by agricultural associations? Do you propose some other mode of appointment than by the Government direct?—I think he should be appointed by the Government.

Q. But you can easily see that if he is appointed by the Government there may be possibly a suspicion that he may be influenced more or less by politics, as it will be a political appointment; whereas, if he is appointed by the agricultural societies throughout the country, it would then not be a political appointment; the Government would simply take the opinions of the agricultural societies?—That would be

advisable, provided the Government did not allow the societies to give too great weight to what they call a practical agriculturist. The great trouble has been, wherever a question of that kind has been left in the hands of agricultural societies or the farmers, that they demand a practical agriculturist for the position.

By the Chairman:

Q. You believe that a Bureau of Agriculture in Washington, if well managed, will be very useful?—I believe it will be exceedingly useful if well managed.

Q. Do you not think it is indispensible?—As a Bureau, yes.

By Mr. Orton:

Q. What is that difficulty you mentioned about a practical agriculturist?—The difficulty, I said, in taking the recommendations of the agricultural societies is, that they are too much inclined to recommend for such prominent positions, that a man should be a practical farmer, a practical agriculturist, and they overlook entirely any such qualification as scientific education. Yet, there is no industry, perhaps, which demands higher and broader qualifications at the present time than that of agriculture; and it is being more fully recognized than ever that a man, to be a successful agriculturist, must have a broad grasp of scientific subjects. If a man is to lead in developing industry as a science, and he is to take charge of the scientific work of this station, he must possess very high qualifications as a scientist and not as a practical agriculturist. A practical agriculturist, as we understand it at the present day, has no special scientific qualifications. We cannot expect to put a man of that kind into an experimental agricultural station, and to bring him up to the necessary qualification; but if we have an able scientific man, a man of proper scientific ability, he can adapt himself to the wants of the farmers, and the necessities of practical agriculture will come within his grasp. It seems to me that in the appointment of such a man it would be advisable for the Government to seek the advice of the agricultural societies; yet the Government should be careful that they do not exercise too great a control in sacrificing scientific attainments to practical attainments.

By Mr. Orton:

Q. In fact, the business of the Bureau would be to provide scientific knowledge for the agricultural people at large?—Yes.

Q. And to give the people the benefit of science, in the way of testing seeds and other matters that are purely scientific?—Yes. It must be remembered that all the practical part of agriculture is based upon scientific facts—scientific knowledge. The first requisite is to obtain exact facts, and then these may be elaborated and adapted to the wants of the practical farmer. But you cannot, in an institution of this kind, carry on practical experimentation which is not based upon scientific accuracy, because the results will be of no permanent value; whereas, if it is done upon a basis of scientific accuray it will be of permanent value, as well as of immediate value. The reason why the German institutions are so successful is because they have been in charge of men of the highest scientific attainments and their work has been strictly scientific in its character. It has been adapted to the work of practical farming, and the farmers appreciate it.

By Mr. Fisher:

Q. I think that reasoning would apply more to the gentleman who is in charge of a station, the professor or scientific man, than to the head of a Bureau. The head of the Bureau would have to be a man who would more especially understand the needs of the agricultural community, and who could view them from the broad standpoint of a statesman; whereas, the specialist who may be in charge of certain work of the Bureau, would be certainly required to be a man of scientific attainments?—If you will excuse me for saying so, I think that there is where one mistake is made. Of course I recognize that a man who is in charge of the Bureau must be a man able to understand the wants of the farming community at large. But, at the same time, he must be a man of high scientific attainments: first, because if he is, he can the more readily grasp the wants of the farmers and appreciate them, and in the second place, because if he is a man of scientific attainments those specialists under him will have respect for what he proposes. If you place in charge of a Bureau of Agricul-

ture, as director of the scientific working of that system, a man who has no scientific qualification, and then if you place under him, in charge of one of the departments of that Bureau, a man who is far superior to him as a scientific man, it is like placing the cart before the horse. You are going backwards. The scientific men who have to do the work would have no special respect for the direction in the way of scientific work that would emanate from such a source. They must be able to look to the head of the whole system as their superior and not as their inferior.

By Mr. Orton:

Q. According to that you would require the head of the Department to be a specialist in every line and it would be very difficult to get a man so qualified?—Not exactly that; you cannot have a man who is really a specialist in all departments of science, at the present time; but if you get a man with sufficiently broad scientific culture, who has the requisite ability, there will be no trouble.

By Mr. Fisher:

Q. A man may be able to appreciate scientific necessities and yet not be himself a scientist; a man of broad, general education, need not specially be a scientist. Again, a man may have the ability to carry on the work of a scientific institution and yet not understand the needs of the community?—It is rather difficult to get a man who has not been educated in scientific work to appreciate the requirements of scientific work. I have experienced that difficulty myself. I have had, unfortunately, to come in contact with men who, though they were well educated in other respects, had not the cerebral knowledge that comes from scientific training, and they could not appreciate the difficulties in the work to be conducted.

Q. Still I think you will find in most of the universities and great colleges of the world that the Principals and Chancellors who have the management of these colleges are very frequently not scientific men in the stricter sense of the term. They are often men of literary attainments and high general culture. Still, they manage the business of higher education and employ scientific specialists to carry on the work under them?—That is true; but the two cases are not similar. In the one case education is the object in view; in the other, the acquisition of scientific facts is the object in view. I think we cannot look at them from the same point in that respect.

By the Chairman:

Q. Under what difficulties does the present system of agriculture labor, and in what respect is the Canadian farmer placed at a disadvantage when competing in foreign markets?—I think that question would be best answered, first, upon the ground of agricultural education. I think there is a need here, as in the United States, perhaps even more need here than there, for a higher system of education which will qualify the farmer to meet and master the problems which are inevitably bound to be presented to him in the pursuit of his avocation. A farmer at the present day, to be successful must have a certain technical knowledge, and the more he has the more successful he will be. I think that is so well demonstrated now that it will hardly need further argument. A man, to be a highly successful farmer, should receive just as much education and just as careful an education in the line of his work as the man who is to undertake a given line of manufacturing. A farmer should be educated in the direction, not only of general knowledge, but he should have accurate knowledge with reference to chemistry, botany, veterinary science and similar subjects. I think there is a problem which requires careful attention, namely, that the education of the farmer's son should be brought up to the highest level, and specially adapted to the wants of his calling.

By Mr Orton:

Q. How do you account for the fact that our very highly educated agriculturists are frequently failures?—Well, that is a question which I will admit, is very often asked. It is sometimes answered by saying that the application of a man's mind to literary or scientific pursuits leads him off in a direction which disqualifies him for practical pursuits; and I think that may be in a large measure true. At the same time, there are, in my mind, some of the most conspicuous examples of men of the

very highest education who are among our most successful agriculturists. I have in my mind, for instance, at the present moment, a gentleman in Massachusetts, who only about ten years ago graduated at Harvard College. He graduated in good standing, and announced it as his intention at once to undertake farming as a life work. He was laughed at by his friends and told that he would make a failure. They urged him, among other things, that his very education disqualified him for practical pursuits. He did not heed what they said, for he felt firmly convinced that he was right. He bought a farm, and to-day he is one of the most successful farmers in Massachusetts, in fact, one of the most successful in the North-Eastern States. His advice is sought constantly in regard to the quality and the merits of Jersey cattle. In fact, he is the authority of the States on those cattle. The gentleman I refer to is Mr. Burnett, of South Massachusetts. I think his case is a very good evidence that education does not hurt the farmer. I do not think that brains are to be considered at a discount in farming, any more than in any other pursuit of life.

Q. At the same time, too much attention to science disqualifies a man from going into the hard work of farming?—I will admit that the more highly educated a man is the less inclination he has for drudgery. I quite agree, too, that that is a proper view to take. I do not believe in a man subordinating his brains to his hands. I believe hands should follow brains. And if a man can make more money by brain work, and by controlling the labor of others, which can easily be purchased, where brains cannot be purchased, I believe in him using his brains.

By Mr Fisher:

Q. One of the great difficulties in this country is that the labor cannot be purchased; it is very difficult to purchase labor in this country?—Is it easier to purchase brains here?

By the Chairman:

Q. What deficiencies have come under your notice in the cultivation of fruit?—The principal difficulty there, is the want of knowledge of the proper methods of combatting diseases. I may mention, incidentally, that we have insufficient knowledge in regard to the varieties of fruit which may be adapted to given climates; but principally the deficiencies are to be found in the knowledge of the diseases attacking fruit. While there are many insect depredators, yet the injuries which I principally refer to now would be those arising from the action of vegetable parasites, or other diseases introduced by deficiencies in food. This question has of recent years demanded very prominent attention, and it has received very careful consideration. In the States of Pennsylvania, Delaware and New Jersey, the peach crop has suffered very severely within the last few years from a disease known as yellows. It is a disease which has now extended into almost every section where the peach is known in the United States. It appears in new land as well as in old land; and some special consideration has been given to determining the cause of the difficulty and the possibilities of correcting it. At the present time I may say our knowledge has reached this degree, that we have probably discovered the source of the disease to be in a special deficiency in nutrition—that is, a special deficiency in the soil, which arises there through excessive cropping and failure to return to the soil the proper elements required. The basis of our belief that the proper cause has been discovered is the fact that trees have actually been restored from a condition of disease to a condition of health. I have in my mind, at the present time, trees which eight years ago were badly diseased, but which to-day by reason of the treatment to which they have been subjected, are bearing fruit which brings the best market prices, where previously the fruit was worthless. The significance of the operations of this disease is to be found in the fact that a few years ago the southern counties of New Jersey were practically the centre of the peach industry of that peach growing state. They were the counties in which the industry was chiefly developed in the State. During my examinations into the subject two years ago, I discovered that through the operation of this disease in the peach, the industry had been entirely driven out of the southern counties of New Jersey, and the peach orchards had been forced northward and were then chiefly to be found in the central and northern

counties. Although the orchards were beginning to reappear to some extent in the southern counties, yet it was found that in the majority of cases the peach could be replanted. The evidence went far to show, from the statements of the farmers themselves, that the difficulty was in soil exhaustion. Now, it is safe to say, from the results obtained in this one direction, that the value of the peach tree may, by proper treatment, as developed through these investigations, be doubled, trebled, and I have no doubt quadrupled. That, I may illustrate in this way: In New Jersey the customary practice, in view of the ravages of this disease, is to root out all the peach trees at the end of the ninth year. They considered that a peach tree nine years of age was past its usefulness. The trees were rooted out and the land turned turned over to corn or something else, so that there were only six bearing years in the life of the peach tree. We have, however, good evidence in an orchard of some two or three hundred trees that has been subject to the disease, and has been treated for it that the bearing period of the tree may be doubled. I have in mind at the present time an orchard in which the trees are now eighteen years old; there the life of the trees has been prolonged by a special method of treatment. The peach tree is naturally a long-lived tree. We have evidence that it lives to the age of fifty or sixty years, and there are cases in which it has attained an age of even ninety or a hundred years; so that there is nothing to prevent us from retaining our peach orchard for a long period of time if we only care for them properly. I have no doubt that by proper care we may at least quadruple the bearing period of our peach orchards, and the same remarks will apply to our other fruits as well as to the peach. In the case of the pear—that fruit is subject to the disease known as the fire blight, of which we have no direct knowledge either as to its cause or its remedy. It is one of the most destructive diseases we have. It appears suddenly and attacks the trees which are killed in a short time. Farmers are almost dismayed at it. They are in as much fear that they will loose their pear orchards as that they will loose their peach orchards The disease is one which requires careful and immediate attention, and it can only be dealt with by men who are scientifically able to do so. Then we have the black knot in the plum. I notice, too, by the papers during the winter that there has appeared in some of the apple orchards of the various Provinces of Canada, especially that of Quebec, a blight in the apple which affects the young branch of the fruit. If that blight is allowed to continue it must result as disastrously to the apple industry as the yellows to the peach, and the blight to the pear. These are diseases which if not checked threaten the entire destruction of our fruit industry. Of course, we cannot say that all these diseases originate in the same way. Some may originate in parasitic plants, as the black knot in the plum. The black knot of the plum is probably introduced in the first place, through injury to a large extent; then the vegetable parasite takes hold wherever the vitality is reduced, and produces a warty excresence. So it is with other diseases. We find that vegetable parasites almost always accompany them, although they cannot be the first cause. The cause is the exhaustion of the soil, and a substantial deficiency there in muriate of potash, which is a corrective. In the disease we find that the vegetable parasites are abundant, but the fact that they are not the cause of the disease is proved by the circumstance that we have them, not only on the diseased tree, but on the tree after it has been restored to a state of health. This shows that the disease is primarily independent of them. These are questions which demand consideration, and I think it is the lack of means to properly cope with these difficulties, which we should regard as one of the great deficiencies in our presens system of fruit culture.

By Mr. Orton:

Q. Is muriate of potash a cheap article?—It costs three or four cents a pound.

Q. Would not salt answer the same purpose?—No; because you have there an entirely different base. Potash is one of the most essential of all plant foods; it is necessary to the formation of starch. Soda is not. Soda, as compared with potash, has very little value. In fact, it is regarded by physiologists that it might in most cases be left out of the plant without injury. If you apply common salt you simply get a chlorine without an essential base. The chlorine is necessary to supplement

the change developed through the action of the potash. For instance, while muriate of potash may be a specific for peach yellows, it is not a specific in pear blight. Then, while the potash is of equal value as potash to both the peach and the pear, yet the muriate is not of equal value. It depends upon the particular form in which these food elements are presented to the plant, as to to their functions, physiologically. It has been found that while the muriate of potash is good for the peach, that the sulphate of potash is better for the pear. We find, for instance, in the case of the peach that it is the chlorine that brings about the distribution through the different parts of the tree of the products necessary to growth, such as the starch. It has been found, not only by recent experiments, but by experiments made a few years ago, that where clorine is withheld from the plant—though potash may be supplied in sufficient quantities to form the starch—the starch will accumulate in the tissues where it is formed: that is, in the leaves or in the branches; it will be stored up as reserve material, and will go no further, because there are no means to distrbute it. Now by introducing chlorine into the plant food of such plants as those in which an abnormal condition has been developed, that starch is distribnted again and the plant makes a healthy growth, and the normal condition will be restored. In regard to the peach yellows, the special deficiency is the deficiency of chlorine. That deficiency in old lands, where the peach has long been cultivated, is the result of long cropping without a proper return to the soil. Unfortunately it has been the practice of our farmers to plant orcharas upon land and to consider that that was all the attention that was requisite. They would take apples from the trees, thus cropping the land constantly, and making no return, while in the next field they would consider that their corn would not grow without a return to the land in the shape of manure. They ignore, in the one case, what they observe in the other. They consider that trees do not require to be fed, but that crops like clover and corn require constant feeding. It should be urged that orchards should be cultivated and cared for, and manured, as carefully and as completely as any other crop; otherwise, you cannot expect to get a continuation of your produce without deterioration.

By the Chairman:

Q. Would the importation of fruit tree scions and plants from Russia and other countries under climatic conditions similar to those of Canada, be of service to our fruit growers?—I think it would. It is by bringing in from other countries the fruits which are peculiar to them and which may be adapted to our particular wants here that we get a greater variety of fruit. Besides, in so doing, we would get fruits which might mature at diffierent seasons and which would vary in their keeping qualities. The great difficulties where we have not a large range of varieties is that the fruits mature at the same time or that their keeping qualities are the same. If we bring in a great number of varieties, and especially fruits of different constitutional qualities, we may get a product which will keep well, in which respect they will be of great service.

Q. Would the establishment of an experimental farm or garden where varieties of foreign grain, fruits, trees and fertilizers might be tested, and whence such seeds, plants, &c., might be distributed throughout the Dominion, be advisable?—I do not think the establisment of one farm for that work would be advisable, but I think it is an important work and that it should be carried on. If properly distributed through stations where that special work was required it would be of the highest importance to the country at large.

Q Would the establishment of a Central Bureau, having for its object the collection of imformation upon all matters relating to agriculture and having a skilled staff capable of giving advice, making experiments, and noting the improvements effected in other countries that might be advantageously introduced into the Dominion, be a benefit to our agriculturists?—Yes; I think it would be of the greatest advantage. I think, perhaps, the special points which that question calls forth have been largely answered in the other questions which we have considered; so perhaps it may be sufficient to say in general that I regard it as of the highest importance to the country.

Q. Do you not think it is of the utmost importance to have an agricultural branch of the Department organized here in Ottawa?—I consider such an organization as of the utmost importance. I should also say that my experience leads me to believe that the work of the experiment stations, so far as they are established, should be centralized in a Bureau of that kind; in other words, that though the stations are put under the immediate charge and immediate control of specialists, their work should be but parts of one well-defined system. That system should be centralized in a Government Bureau, which, for the Dominion, of course, would be properly placed at Ottawa.

Q. Would the dissemination of handbooks and reports containing information on culture, stock-raising, dairying, poultry keeping, etc., have a beneficial effect?—I think, upon general principles, that the dissemination of reports is of great value. They are, of course, largely, the only way that we have of reaching the farmers at large. At the same time, it is a question how far a Bureau of Agriculture should distribute handbooks. The function of a Bureau and of experiment stations, it seems to me, should be the collection of facts, and the distribution of reports containing those facts. It might properly devolve upon a Bureau, or upon the stations, to issue annual reports and occasional bulletins, which would cover the essential facts developed by research; but the distribution of handbooks is rather a different matter. It seems to me, that the material contained in handbooks is rather an elaboration of facts obtained by scientific research, and their application to the practical wants of the farmers; and that work ought rather to be left in the hands of outside parties. While such work might be judiciously encouraged by the Government, it does not seem to me to be the work that should be immediately undertaken by them. It should be left to outside parties, who would be encouraged in it. There are always parties who will undertake it. In fact, the great trouble in some cases has been, that there have been too many handbooks issued, and that they contained only useless repetitions, but they often, in the attempt to render them too popular, carry the elaboration of scientific facts to an extent which injures their value. Handbooks are likely to do injury rather than good, unless the material in them is properly controlled. The Government Bureau or experiment station might do an important work by controlling the matter which enters into the composition of these handbooks, and exercising a proper supervision as well as encouragement in their preparation.

Q. Would the issue of monthly bulletins and abstracts containing information regarding agriculture be of sufficient advantage to warrant their publication?—I think they would; I think occasional bulletins serve a very important purpose. But the matter which enters into their composition should be very carefully regulated. Bulletins may give such information as would be of immediate value upon the matter of fertilizer analysis and soil analysis, special directions for the care of animals, or something of that kind; but they ought not to enter into the discussion of principles. The function of the bulletin is simply to disseminate, in a compact, concise form, a few essential facts for immediate use.

Q. Do you think the services of the entomologist in Washington have been useful?—They have been of the highest value. Of course, I cannot give as exact testimony upon that as an entomologist would; but speaking in general terms, the services the entomologists have rendered in enabling us to deal very exactly and correctly with the various insects which act upon our fruit trees, and grain, and other important farm crops, have been of the highest value, and entomology is one of the special lines of scientific work, as bearing upon practical agriculture, which should receive the first consideration.

Q. Have you any other suggestions which you might offer to the Committee?—I do not think of any at present.

A GRANGER'S DEPUTATION.

A deputation consisting of Mr. W. S. George, of New Brunswick, Chairman; Mr. R. W. Starr, of Nova Scotia; Mr. William Brock and Mr. E. Lethbridge, of

Middlesex, Ontario; and Mr. L. VanCamp of Bowmanville, Ontario, members of the Dominion Grange, was introduced.

Mr. George:—Mr. Chairman in compliance with an invitation from your Committee, a Committee was appointed by the Dominion Grange to meet you here to-day, and to present to you replies to the series of questions submitted for our consideration. I will read the questions and the replies:

Q. Under what difficulties does the present system of agriculture labor, and in what respect is the Canadian farmer placed at a disadvantage when competing in foreign markets?—Under the present system of immigration farmers find it impossible to obtain farm labor at remunerative prices, as the immigrants landed in Canada, who are suitable as farm laborers, are principally absorbed by the cities; that incorrect impressions are conveyed to intending immigrants by agents and others, as to the labor required and the wages paid. And the same principal applies to domestic servants. Consequently the farmers of this Dominion are not in a position to compete in foreign markets.

Q. What deficiencies have come under your notice in the cultivation of cereals, cultivation of roots and grasses, raising of stock and wool growing, production of butter and cheese, culture of fruit, fertilizers in ordinary use?—Great deficiencies in the cultivation of those crops arise from the great want of farm laborers skilled in cultivation and lack of good and cheap fertilizers.

Q. Would the importation of seed from foreign countries benefit our farmers?—Yes, if imported from similar climates and carefully inspected.

Q. Would a general system of inspection and branding be likely to enhance the value of our butter and cheese in the home and foreign markets?—A just system of inspection and branding would enhance the value of our butter and cheese in foreign markets.

Q. Would the importation of fruit tree scions and plants from Russia and other countries under climatic conditions similar to those of Canada, be of service to our fruit growers?—Yes.

Q. Would the appointment of a public analyst, to whom samples of soil and of home manufactured and imported fertilizers might be submitted, prove of advantage to our farmers?—Yes.

Q. Would the establishment of an experimental farm or garden, where varieties of foreign grain, fruits, trees and fertilizers might be tested, and whence such seeds, plants, &c., might be distributed throughout the Dominion, be advisable?—The establishment of an experimental farm in each Province of the Dominion would be a great advantage to the farmers.

Q. Have you noticed any appreciable deficiency in the crops of your district, owing to the depredations of birds and insects?—Crops have suffered from insects.

Q. What crops and fruit products have suffered most, and from what classes of insects or birds?—Wheat and clover, from wheat midge and Hessian fly; peas, from pea bug; potatoes, from Colorado beetle; apples, from coddling moth, caterpillar, canker-worm and, in some cases, the borer; plums, by the curculio; currants and gooseberries, by the currina worm, and cherries, by the robins and cherry birds.

Q. Have any, and what, steps been taken in your district to keep down insects and birds injurious to vegetation?—Paris green has been used for potato bug and canker worm, white hellebore for currants and gooseberries.

Q. Can you furnish the Committee any details as to the amount of loss sustained by agriculturists in your locality from bird or insect pests infesting grain, clover, onions, turnips, potatoes, pease, beans, cabbages, tomatoes, squashes, apples, pears, plums, grapes, strawberries, currants, &c.?—Loss is considerably large, but can make no definite estimate.

Q. Have the timber trees in your district suffered from any of these destructive agents?—In the County of Pictou, N. S., in the years 1881, 1882 and 1883, the hard-wood trees were stripped of all foliage and died; also, in the County of Kent, Ont., the maples were injured to a large extent.

Q. Would the appointment of an entomologist, whose duty it would be to give information concerning birds and insects injurious and beneficial, and the means of protecting the crops against their ravages, accomplish any benefit to the farming classes?—Yes.

Q. Would it be desirable to extend the duties of the present system of veterinary inspection of stock in quarantine and, if needful, the staff also, with the view to deal with the local development of infectious diseases among farm stock and poultry throughout the Dominion, and the best means of stamping them out?—The present system of quarantine is satisfactory.

Q. Have any steps been taken to maintain the supply of standing timber, or to replant, where it has failed?—Only for ornamental purposes.

Q. Would the establishment of a Central Bureau, having for its object the collection of information upon all matters relating to agriculture, and having a skilled staff capable of giving advice, making experiments, and noting the improvements effected in other countries, that might be advantageously introduced into the Dominion, be a benefit to our agriculturists?—It would be a great advantage to agriculturists.

Q. Would the dissemination of handbooks and reports containing the data thus collected, on culture, stock-raising, dairying, poultry-keeping, &c., have a beneficial effect?—Yes; it would be a great advantage.

Q. Would you recommend, in this connection, the formation of a section devoted to agricultural statistics, showing the acreage under the different crops, the movements and prices of grain, cattle, &c., rates of transportation, fluctuation of foreign markets, &c.; and what advantages might be expected to accrue therefrom to the producer?—Yes; it would place the producer in a position to know the market rates.

Q. Would the issue of monthly bulletins and abstracts containing such information be of sufficient advantage to warrant their publication?—Yes.

WM. F. GEORGE,
WILLIAM BROCK,
GEORGE LETHBRIDGE,
LEVI VANCAMP,
Committee on Agriculture from Dominion Grange.

I also hold in my hand a copy of the resolution passed last evening, as follows:—

"Moved by R J. Doyle, seconded by W. F. George—*Resolved*, That this Grange desires to express its approval of the appointment of a Select Committee of the House of Commons, having for its object the consideration of what steps should be taken to place the Department of Agriculture in a position to better promote and encourage the agriculture of the country. Also, having received a list of questions from the Secretary of said Committee, we return those questions with our views expressed in answer. While our exports are many times larger and more important than our manufactures, the cost of legislation to develop agricultural industries is comparatively light, and quite inadequate for that purpose. Entomologists claim that the loss from insects is 10 per cent., and that it is a loss which is largely preventable. It seems to us that the Central Government ought to take action on these matters, because it can do that which, if required to be done by each Province, would cost much more, and with the possible result that some of the Provinces might neglect to take any action owing to the expense involved in proportion to the area and population. There is no lack of precedents for Government action in these matters. In view of the circumstance that this Dominion depends very largely upon agriculture for its prosperity, we deem it of the utmost importance that the Department of Agriculture should spare no reasonable expense in fostering and developing this industry; and to do so successfully it is necessary that special officers shall be appointed whose duty it is to make themselves acquainted with the requirements of agriculturists, and the best means of supplying them."

Mr. *Foster*:—Have you any remarks to make in support of this resolution?

Mr. *R. W. Starr*:—Mr. Chairman, in regard to the ravages of insects among our fruit and forest trees, there is no doubt in my mind that some legislation is ne-

cessary. It is difficult to stamp out anything of that kind by the efforts of individuals. The destruction of forests in the County of Pictou, Nova Scotia, is a matter well worthy of the attention of the Committee. I know, from my own personal knowledge, that the destruction there has been something beyond conception. The insect that has been doing the damage is the forest caterpillar. An insect of the same kind that has been for years fed on the forest trees, has, by the persistent efforts of the farmers, been kept down. When it affects the apple, there is but little difficulty in keeping it down, because everyone is interested in keeping it down, but, unfortunately, it is just as fond of the oak as the apple. Wherever there are large groves of oak, it is almost impossible to get their owners to destroy it; as a result, the caterpillar has increased wonderfully, and in some places I could mention valuable groves of oak have been destroyed. Our shipping interests and implement manufacturers are suffering in consequence. The other insect depredations are pretty persistently followed wherever men are enlightened enough to know the value of destroying them. Through the efforts of the Fruit Growers Association, whose publications are circulated widely, and by individual efforts, they are now apparently in check; but every once in a while there is a year in which they are extremely plentiful, and they get beyond us altogether. That is the case with the canker worm. They come in cycles. The codling moth which is, I understand, is bad in this part of the country, has been kept down by us by persistent cultivation of the soil and the destruction of the larvæ, which in our country seek refuge in the soil in the winter season. There is another trouble to which we are subject, which I might mention. It is the black knot which, I presume, is a fungoid growth. The only method of dealing with it is by persisnt stamping out, by destroying the trees attacked by it just as persistently as cattle troubled with *pleuro pneumonia*.

Mr. Bain:—Have you had steps taken to bring that subject before scientific men.

Mr. Starr:—Yes; scientific men give us their opinions and we try to profit by them as far as we can.

Mr. Bain:—It is not so much not knowing, as being unwilling to apply the remedy, which, in the case of the forest trees, causes the trouble.

Mr. Starr:—There is where we require more knowledge, and there is where scientific men are required. Where thousands of acres are subject to the destroying influences of these insects, it becomes more than individual effort, or even municipal effort, can wipe out.

Mr. Bain:—The trees have died from the effects of the foliage being destroyed.

Mr. Starr:—Yes; successive devastation of the foliage has destroyed the trees.

Mr. Fisher:—Has no effort been made to bring the matter before the attention of the Nova Scotia Government?

Mr. Starr:—I think not. It is only within a year or two that I have heard of it.

Mr. Fisher;—Have scientific men in Nova Scotia observed these effects and given their opinion upon them.

Mr. Starr:—Yes.

Mr. Fisher:—Do you know the area that has been injured by the depredator?

Mr. Starr:—A rough estimate made, I think, was 2,000 acres in the County of Pictou.

Mr. Fisher:—Do you think the causes and the proper remedies are known?

Mr. Starr:—I do not think that the necessary remedies are known.

Mr. Fisher:—And you think that scientific men ought to be able to find out and recommend the remedy?

Mr. Starr:—Yes.

Mr. VanCamp:—I agree with the replies made to the questions by the Committee of which I am a member; but if I may be allowed to express my experience in agriculture in the Province of Ontario, it may be of some advantage to hear. My attention has been drawn to the remark by the gentleman at the head of the table (Prof. Penhallow) advising a practical knowledge for farmers. Now, I have spent

my life in the business of agriculture, and for the last thirty-seven years I have made it a point to closely observe my surroundings, in order that I may know the prosperous men. Now, gentlemen, in my immediate vicinity, within that time, we have had a great many emigrants come in from the old country, and amongst them the most prosperous men we have had in the business of agriculture have been men who have signed themselves this way: X. I can show you men worth $100,000 who have acquired that sum within thirty-five years, and who came in not worth a dollar. I have also paid particular attention to the men who have come in and have undertaken to practice science. Whilst this conversation was going on, the whole thirty-seven years passed before my view; and in the united counties of Northumberland and Durham, I do not know, to-day, any of those men who are in the position that they were in when they landed in our country. As for the insect scourge in agriculture, it places the agriculturist in a continual warfare, from the time the frost leaves the soil in the spring until it binds it up again in the fall. During all that time the agriculturist has no leisure. If he wishes to be prosperous he will only take sufficient time to eat his meals and sleep. At other times he will be carrying on a continual warfare with these insects. I have taken particular care to observe the man who neglects his duty on this point, and he is a failure in every respect. There is something to attack everything that the farm produces, and if we do not give our attention to it that crop is sure to be a failure.

By Mr. George:—I did not suppose that any of my colleagues would disagree with me, either so far as the sentiments in the replies to the questions, or those embodied in the resolution, are concerned. My friend Mr. VanCamp, however, seems to think that the man who succeeds in life is the man who only makes an X to his name.

Mr. Van Camp:—You misunderstand me. I say the most successful men in agriculture in my vicinity have been the men who have signed their names in that way. I do not class myself among those, though I have been a successful man. I can sign my name; I can write my name.

Mr. Orton:—What you mean to say is that agriculture requires a very great deal of watchfulness.

Mr. Van Camp:—Yes; and a great deal of common sense.

Mr. Foster:—You do not suppose it would be any disadvantage to them if they could sign their name in a better way.

Mr. VanCamp:—I do not suppose it would.

Mr. Foster:—Education would not make up for a lack of common sense; but having common sense as a starting ground, you could not injure it by education.

Mr VanCamp:—No.

Mr. Fisher:—In regard to insect life: do you not believe that a knowledge of insects would have helped your people against them?—Do you not think that men who have studied these insects all their lives, and have made a special study of them might have given you a little assistance by telling you the best way of fighting them?

Mr. VanCamp:—I suppose they might, if they took them in the early stages.

Mr. Fisher:—Do you not think it is quite likely that a man who has for ten years studied one insect might be able to instruct the farmer in regard to the manner in which to battle with it.

Mr. VanCamp:—Yes.

Mr. George:—I am glad to receive the explanation of my friend. I have no doubt that in some respects he may be correct. I have known men with little education who have been successful, but the cases are exceptional. In my experience, wherever I have found an educated man with any amount of perseverance and determination in him, that man has always succeeded. I have never known a failure. Occasionally a man without any education, but having good natural abilities and determined to succeed, will succeed. A man will succeed in any business if he applies his mind to the subject. But if we want the agricultural industry to prosper we must have educated farmers, and they must be in a position to get all the informa-

tion possible. The establishment of this Agricultural Bureau, which the Government now has in view, will, I think, be one of the means of disseminating the information that is required.

Mr. Starr :—I think Mr. VanCamp mistakes the position. His argument is perfectly just as regards pioneers. They must have muscle, and plenty of it. But at the present day, when the country is cleared and the farmer has to come into competition with business men and with other farmers, you want brains.

Mr. VanCamp :—I think my Nova Scotia colleagues do not understand me. I am an advocate of education, but what I was referring to was extremes. I was thinking of the question advising scientific education; and I say now that if we had a scientific class of farmers, wholly, it would be death to our country.

Mr. Kirk, M P. :—Have you found any method by which you can successfully combat the weevil in Ontario?

Mr. VanCamp :—I will answer that question in this way. The weevil comes to us from the east. We had heard of it from the east before it came. In fact I was warned by one of the largest grain dealers in our county that it was coming, and he said : " You will have to make a change in the management of your crops; you will have to turn to something else." We found that the only thing we could do with him was to starve him out. We had to quit raising certain kinds of wheat, and we found a kind that would answer if we sowed it late. For quite a number of years we run on this wheat—it was a Russian wheat—and we were fairly prosperous. But he changed his custom and came again; he came down to our rule and we were in difficulties again.

Mr. Kirk :—What wheat did you use?

Mr. VanCamp ;—It was what we call in Ontario the old Fyfe wheat. It would bear to be sown later than any other grain we have had. For quite a time it relieved us from the weevil and the midge; but since the weevil has changed his custom and come to our rule, we have had to take our chances. Some years we would not get a crop, and other years would get a crop.

Mr. Orton ;—In some parts of the country they abandoned the growing of wheat altogether in order to get rid of it?

Mr. VanCamp :—Yes.

Mr. Orton :—And it affected the fall wheat as badly as the spring wheat?

Mr. VanCamp :—Far worse.

Mr. Jas. Fletcher :—I have been asked to advocate the views of the entomologists. I should like to suggest to the last speaker that what he condemns, viz., a scientific education, is just what he requires. A gentleman asked for information regarding the weevil, and he made a reply about the midge. Now, the weevil is a beetle; the midge is a fly, and the remedies applicable to the one are not applicable to the other. The one great necessity among our farmers, therefore, is a certain amount of scientific knowledge. We all recognize the importance of farmers. They probably form one of the most important classes of the population; when, then, they complain that their crops are being ravaged by insects, they demand attention. But, if they do not let the people who make a special study of insect pests know what they want, and the character of the insects that are preying upon their crops, they cannot expect to get the remedy. I was not aware that the weevil, as an injurious insect, was in that part of the country yet. I shall investigate the matter. As a member of the Entomological Society of Ontario, a society actively engaged in the investigation of injurious insects, I shall enquire into the matter and shall be happy to give the gentleman who has made the enquiry the results of our investigations. But what I want to draw attention to is this, that if a farmer asks for information about a certain insect, and calls it by the name of some other insect, he cannot get the proper remedy and, as a result, his crop is not saved. Therefore, some scientific information is necessary for the farmer. It is a growing necessity to the country that the Government should distribute among the farmers information in the most easily received form, that is, in a form that the farmers will take notice of it, and read it and apply it to their own case. If the Government can distribute their information

in a practical form, not too scientifically expressed, it will be a most fertile source of good to the country. The Chairman of the Grange has mentioned 10 per cent. as the extent of the insect ravages. There is no doubt that it is all that; but I honestly believe that it is more like 20 per cent. We know that certain crops are wiped out *in toto*. From the answers to the questions the Committee has sent out, you will find that the clover seed crop last year was almost totally destroyed in some parts of Canada. As a member of a society which has been engaged in trying to collect information regarding these insect pests, I may say we find the greatest difficulty in getting inquiries made by the farmers. They will not send for information. A farmer will say his crop has been wiped out, and when we ask, "Did you send for information," the reply is "No." But do we find that sort of thing in ordinary life? A man's child is taken ill. He sends for the doctor at once. And what is the doctor but a specialist in one branch of study.

Mr. Foster:—Do you not think that one reason is that in the one case the farmer knows where the doctor lives, and in the other he does not know where the entomologist lives?

Mr. Fletcher:—Of course there are a very few who make a special study of entomology, and it is exactly in this way that a State entomologist would be useful. But every farmer should be an entomologist. He should know something of the science. He knows already that these insects deprived him of an enormous proportion of his produce. It has been estimated that every plant growing on this continent has six different species of insects preying upon it and destroying it; but it is probable that there are remedies which can be applied to keep all of these in check. Some of the remedies are very complicated and hard to apply. But it is the work of the entomologist to suggest the most simple remedies. There are plenty of complicated remedies. If these are resorted to, but from some cause fail, then the whole cause gets discredited, and the entomologist is unable to secure the sympathy in his work which is necessary for success. Now we must have sympathy in this work, or no one will do it. With reference to the midge-proof wheat this gentleman has referred to, I may say it is some of the old wheat that has been improved. All the different varieties of wheat have their characteristics. In one we find a fine kernel and bad chaff, in another good chaff and a bad kernel. And the best way to deal with these is to hybridize them, to bring one that has certain characteristics, and to apply those characteristics to another. This is done in wheat just as it is done in fruit. In fruits, if we take the pollen of a tree, the qualities of which are high, though it may not be thrifty, and apply it to the pistil of a tree that has a very vigorous growth but poor fruit, and possibly an immunity from certain insect pests, we get a combination of the two and, as a result, a fine, thrifty tree, with a fine fruit. This has been studied by scientific men, particularly by Mr. Saunders, of London, Ontario, who has made a special study of it. I think the reason why insects are so injurious in Canada is first of all, owing to the very small percentage of students who study entomology, and then the difficulty that those who do study experience in getting information as to where the insect depredations are going on. If they could know where a crop was being attacked by insects, they could go off at once and visit the locality, and studying the matter on the spot would be more likely to suggest the best remedy. The remedies then should be applied to the proper causes. In Ontario there is an Entomological Society which, I think has disseminated very valuable information for all horticulturists, agriculturists and fruit growers. If that society can get information from any of the farmers of the country, that they are losing their crops, they will be happy to send some one to investigate the matter and to suggest remedies. We owe to Mr. Saunders, who has been engaged for many years in that work and who has certainly done more than any other man in Canada in that direction, the discovery and application of a very good remedy for insects preying upon such crops as Paris green cannot be applied to—as, for instance, the cabbage: We know our cabbage are suffering very much from a pest imported from Europe, the white cabbage butterfly (*Pieris rapæ*). Now, I have actually seen in the papers, the application of Paris

green to cabbages advised, and the statement made that it will be safe if the cabbages are washed before they are prepared for the table. That may, or may not be the case. At any rate, I do not think any large growers of table vegetables would dare to apply a poison like arsenic to his cabbages, and then expect his customers to buy them. I do not think any one would buy them. Under the most favorable circumstances, it takes some months for the Paris green, by the chemical action of the soil upon it, to lose its poisonous properties. Now, Mr. Saunders has found that what we have been using for a number of years, under the name of Persian and Dalmatian Powder, for household pests, for bugs, and so on, can be applied without danger to cabbages and garden plants. It is a powder made from the pounded flowers of different species of pyrethrum. So applicable has this been found since Mr. Saunders discovered it, that a large farm has been started in California for the cultivation of the plant, from which they have produced enormous quantities of this poison, which is known by the new name of Buhach. It has been produced simply in tons; and the firm has promised that within a short time the price of the poison will be so reduced that it can be applied by everybody over the whole of their gardens. Now, a small portion of this poison in water, thrown on to the plants by means of a pump, has been found to have the best results on those insects which attack our garden produce. It is curious that this remedy has a very subtle effect. It is not necessary for the insects to eat it. The very contact of the body with the powder or even the volatile oil from it will kill it. Now, if this room were full of flies and a small portion of the powder were burned or even puffed into the air in the room, it would paralyze them, and they would, before long, fall to the ground dead. It has been very useful with the cabbage worm, which is a very hard one to fight, and also with those very troublesome pests in greenhouses, the aphides. If I am not detaining the Committee too long, I should like to refer to the importation of parasitical insects. A large proportion of our insects are parasitic. Nearly every insect has its insect enemies; particularly there is a large proportion of the *Hymenoptero*, or those insects to which the bee and the wasp belong, which live, during one of their preparatory stages, inside the bodies of the larvæ of other insects; the egg is laid on or inserted under the skin of the insect. These parasites feed on the inside of their hosts, and they remain until they are ready to emerge, and thus destroy them. We find that the cabbage butterfly is affected by one of these parasitic species. In England, that butterfly is kept in check by these parasites, to a great extent. Out here we have also this parasite, and I believe we should not have very much trouble with the cabbage butterfly if one could propagate its parasitic enemy. The Hessian fly is not so much of a scourge now. We got it from the east. This insect has been known in Europe for 150 years, but it has never, during the whole of its history in Europe, been the serious pest that it has here. It has been found by etomologists that there are no less than three small flies which are parasites upon it. When you consider that the fly itself is so small—it is about one-third the size of a mosquito—you can well understand that the parasite must be very small. There are no less than three different species known which feed upon this species, and keep it in check in Europe. If we can get those parasites introduced here in Canada, and then propagate them and distribute them through the country, why should we not have immunity from this pest, which destroys such a large proportion of our crops? But then there is a difficulty in the way; we may introduce some which would be as bad as the pest itself. Therefore, it would have to be a study carried out by a scientific man who would give care and attention to it. It would be a work of immense labour, but such a work as a scientific man would gladly undertake. It would have to be very conscientiously performed, and very great precautions would have to be taken to guard against mistakes. These parasites could be certainly introduced. When they come here they would prey upon our insects here. It may be thought that they may change their habits when coming to a climate different to that under which they live in Europe. It has been found by investigations in Kew Gardens, in London, that plants alter their habits and nature when coming there. Notably is this the case with

the chincona. But as with plants, so with insects, the work would have to be very carefully done, so that if it were necessary for the parasite to alter its habits, the change could be effected gradually. At any rate this is a surmountable obstacle. The codling moth, now, is very injurious; it and the apple shell bark louse are the two most injurious insects in Canada. There is hardly an apple to be found around Ottawa here, that is not destroyed by these insects. The codling moth certainly can be fought with a little care. Every farmer having an interest in this matter, and being an entomologist to a certain extent, would, no doubt, for his own sake, carry out certain prescribed regulations. A Central Bureau might distribute monthly statements regarding the pests expected to attack the crops, and suggest the remedy. No doubt, then the farmer would gladly and promptly adopt the remedy, and thus much damage and loss would be avoided.

The Committee adjourned.

OTTAWA, 11th March, 1884.

The Committee met, Mr. GIGAULT presiding.—G. J. O'DOHERTY, of Ottawa, called and examined.

By the Chairman:

Q. What experience have you had in the sorghum industry?—I may state that I only spoke to the Chairman of your Committee last evening and I have not entered thoroughly into this question; I can, therefore, only speak of what I know in a general way. Some three or four years ago I became interested in this question of sorghum growing and its manufacture into syrup and sugar, and I got up a factory here and partially completed it. I worked up a small quantity of cane.

By Mr. Landry:

Q. In what part of the country was that?—Right here in Ottawa. The result was very satisfactory. I got the syrup at the rate of about 120 gallons per acre, and it was very fine. Since then I have not done anything with it. I was engaged in other ways, and I had to tell farmers who asked me, that I would not be prepared to work up their cane. There was not enough of it. Unless a sufficient number would go into the business of growing, I could not afford the time to work up their cane. I may say that I have looked into the question in the United States and I find that the growing of sorghum has been very successful there. They are gradually improving, not only in manufacturing, but in their machinery, and they have it so now that they make a very fine article of syrup and a very fine sugar. Last October I went out to Rio Grande, in New Jersey, eight miles from Cape May, and I found a very large factory in operation there. They had 1,000 acres of cane growing around the mill, and they used, besides, other cane supplied by the farmers in the vicinity. They were producing twenty-five barrels of sugar and twenty-five barrels of syrup every day. The manager reported that everything was working very satisfactorily. In conversation with him, I asked him how it was he grew the cane on such poor soil as that appeared to be. "Well," he said, "the State offered me inducements to establish the factory here, and it has been very successful." Sorghum has been grown in the United States since 1850. For the greater part of that time the business was conducted by parties who knew little or nothing about the mode of treating it. The juices were much poorer than those from the maple tree. The syrup from the cane requires very different treatment to that from the maple. You can make a fair article of maple syrup by simply boiling in the ordinary kettle; but, inasmuch as the sorghum cane is crushed between rollers, and the impurities are crushed out as well as the saccharine matter, it requires very careful treatment, in order to make a good article of syrup. Hence the farmers there were not successful. They produced a very black, strong product, and it was not at all satisfactory, though they used it for home purposes. Of late years, the Department of Agriculture, at Washington, has given a great deal of attention to this matter. They have made a special study of it and they have succeeded now in producing a very

fine article of syrup and sugar. The average yield of syrup per acre—which would include the sugar, because they do not in all cases crystalize it into sugar—is from 100 to 200 gallons. They have gone over that, but that would be a fair average.

By Mr. Bain:

Q. Does the cane vary according to the soil in which it is grown in saccharine matter?—I have not found that to a great extent; it will vary more in its crystalizing properties. Cane grown on sandy soil will crystalize more sugar than that grown on mucky soil; but in the matter of syrup I do not find much difference

Q. The cane will make as much syrup?—Yes.

Q. But its crystalizing quality is due to the soil?—Clay soil is better for manufacturing purposes than sandy soil; but all soils which are dry enough will produce it well. I now come to the quantities grown in the United States. In 1854 there were 3t6,670 acres of sorghum in the United States. In 1860 there were 7,000,000 of gallons manufactured. In 1870, there were 16,000,000 of gallons and twenty-four hogsheads of sugar. In 1875, in the State of Kansas alone there were 23,000 acres under cultivation, and the produce was 2,542,512 gallons of syrup. I may say that in addition to the large factory at Rio Grande, there is also one at Champagne, Illinois. This factory originated in this way: A professor of chemistry in the employment of the State in Illinois, undertook to work out or elaborate the crystalization of sorghum. He succeeded so well that he took out a patent, left the employment of the State and went into the factory. That factory made in 1882, 86,000 pounds of sugar and 26,000 gallons of syrup. They have succeeded so well that they have established similar factories in different parts of the State. I have not reports from them as to what their success has been; nor have I the result of the work at Champagne last year. In Kansas there is a very large factory, also. They must work up at least 1,000 acres of cane every year.

Q. Do you know cases in which they have manufactured under climatic conditions similar to those here, because I suppose something would depend upon the climate in maturing the cane?—They have been manufacturing in Minnesota for a great many years. I know that from 1871 to 1874, when I was there, they were manufacturing. I have been in correspondence with leading manufacturers since, and they write me that they still manufacture, though occasionally they have a bad year, which happens when there is a short season. Some of the parties write me that they find they can make more per acre growing sorghum than growing any other farm product.

Q. What variety do they grow now?—The variety best suited to this country is the early amber. It is a native of Minnesota, a cross between two other varieties of the sorghum family, and is found to be earlier by two weeks than other varieties It produces a brighter syrup, a syrup that is more easily crystalized than the other syrup.

Q. About what height does it grow?—We grew it here two years ago 12 feet high, but the average may be put down at 8 feet.

Q. At what time in the season does it get sufficiently matured to enable you to commence making sugar? I suppose your experience on that point is rather limited and you cannot tell?—It was in September.

Q. You see we very seldom get past September 15th without a killing night's frost?—Some years we get caught; but I may say it will succeed wherever Indian corn will succeed. The soil required is the same; the cultivation required is the same, and the treatment in almost every way is the same, up to harvest.

Q. How do you preserve it when it gets ripe? Can you keep it for any length of time?—It will keep standing until frost comes.

Q. I suppose you would be confined, in working it, to the period between the time that it is sufficiently matured and the time the frost comes, so that the season would be comparatively short?—Comparatively short, but long enough for the farmers. It would be as long as they have for maple sugar operations They would have from two to four weeks here. In Western Ontario they would have anywhere from four to six weeks to work it in. I find that the cane matures here, and is quite

as rich in saccharine matter as it is further south. In fact, it is quite as rich as the ribbon cane, which is the true sorghum cane of the South. The difference between this cane and the ribbon cane is that the ribbon cane is planted once every five years, whereas, the other is planted just like corn. It will ripen in from 100 to 120 days. In seed it will produce twenty or thirty bushels to the acre, and the seed is quite as good for feeding purposes as corn.

Q. Is the seed sufficiently matured to be useful?—Yes; fully matured, so that it grows afterwards, even here.

Q. And you get both the seeds and the saccharine matter?—Yes; the seed makes very fine food for hogs or chickens, for cattle or for horses.

By Mr. Landry:

Q. Boiled?—You can give it to them boiled or raw, just about the same as corn. In some places it is ground up and flour is made out of it. In that case it is just as well if the hulls are removed, because there is a large amount of tandem in the hulls. I may say, as to Canada, that a great deal of attention has not been devoted to it. Farmers are afraid to take hold of it; they are afraid that it will not prove successful. It is a new thing here, and they are afraid to take hold of it. They have no machinery, and they hardly know anything about it.

By Mr. Bain:

Q. How many acres would it be necessary to plant in order to make it worth while to buy moderate machinery? What is the smallest amount you can work it on at a profit?—You would have to give me that question more fully. A farmer may have as low as two, three, or four acres, and have plant to suit it.

Q. So, the machinery can be adapted to be used on a small quantity?—As small as you like. The most successful and profitable way to carry on this business is by the erection of central factories, just as you start your cheese factories or creameries. They are working on that plan in Demarara and some of the regular sugar States. Men are starting factories and the farmers are bringing in the cane.

Q. And you get better plant that way?—Yes; you can get better plant. You know you can spend from $150 to $100,000 in plant.

By the Chairman:

Q. Do you believe the sorghum cane would be destroyed by frosts very often here?—Occasionally it would, just the same as corn is. It is subject to the same climatic conditions as corn. Early frosts would take it the same year that they take corn. But there is a large portion of Canada—the southern portion—where it can be very profitably grown; in fact, more profitably than almost any other field crops.

By Mr. Benoit:

Q. Does the frost take away the saccharine matter?—No; but unless it is worked up immediately after it is frozen it is spoiled.

Q. I suppose it is like corn—the juice sours?—The juice sours immediately after the heat gets it; after it has been frozen it ferments.

Q. In that case it should be manufactured immediately after the cutting of the plant?—Yes.

Q. And suppose it is sent to a factory?—They are supposed to manufacture it immediately after it is brought in.

Q. Suppose it is allowed to stand for a month?—They cannot let it stand that long.

By Mr. Bain:

Q. I suppose there is no process by which it can be allowed to dry and get the moisture through it again?—That has been done. Instead of grinding it they have adopted the infusion process; they get a better sugar, but that has only been done in the regular sugar cane plantations.

Q. If it could be introduced it would lengthen the season of the plantation very much?—Yes; it would.

By Mr. Benoit:

Q. Is it not possible to store the material in a shed for some time?—No; they cannot do that on the plantations south, the heat would spoil it. That can be done

in no way. It will stand very well in the field, but if you pull it, it will heat and sour.

By Mr. Bain:

Q. I suppose beet-root is the only thing that will store and manufacture into sugar afterwards?—About the only thing.

By the Chairman:

Q. What is the average yield per acre?—From 100 to 200 gallons of syrup.

By Mr. Landry:

Q. And of sugar?—It has been found to yield, in the Champagne factory alone, from five to seven pounds per gallon.

By Mr. Bain:

Q. What kind of sugar is turned out?—The sugar I saw was a nice yellow sugar. It was was well crystalized and of a hard grain.

By Mr. Benoit:

Q. What was the taste of the syrup?—Like the ordinary syrup.

Q. Any smell?—That is all removed by chemical process: by a process of filtration.

By Mr. Bain:

Q. Is the process intricate?—As with making cheese or butter it requires close attention and considerable skill. A clumsy person cannot make it properly; but any one who can make good butter or good cheese can make good syrup. I mean, anybody having the intellect to make the one can make the other.

Q. There is not any particular chemical process that you have to put it through?—There is; but it is a simple one. The cane juice is naturally acid, and you have to neutralize that acid by chemical agency. You take carbonate of lime or some other alkali and it will neutralize it. Ordinary lime or milk of lime is what is in general use for that purpose. It is used on the sugar plantations. When you get the acid neutralized there is nothing but filtering to be done afterwards.

By Mr. Benoit:

Q. Did you sell any of the syrup you made?—I did.

Q. At What price?—I got 70 cents a gallon.

By the Chairman:

Q. So you believe that sugar cane culture may be made a success in Canada?—In the southern portions of Canada it can be made a decided success.

Q. What would you suggest as a means of encouraging its growth?—I would suggest that the Government should offer inducements, as is done in the American States. In the American States they granted a bonus of $1 a ton for every ton of cane grown and brought to the factory, and a cent a pound upon the product.

By Mr. Bain:

Q. Does the United States Government give that, or the local authorities?—It was given by the State Governments. They gave a certain price per ton on all cane grown and brought to the factory to be manufactured, and then a certain other bonus on the product manufactured. That was done until the farmers got to understand it.

Q. Redpaths would object to that?—I do not think it would interfere with Redpaths', because they could take this sugar and refine it into white sugar, and it would be a better article than they can get in the West Indies.

Q. They buy low grades there?—It would not pay them to take low grades; it would pay better simply to make the syrup than to make a low grade. Inasmuch as that those who are now manufacturing the sorghum sugar in the United States do not use any acids to bleach or brighten it in any way, that sugar is more in demand than the refinery sugar, for bakers' purposes, and so on.

Q. It would be rich in saccharine matter?—Yes; and very free from acids. If you introduce any sulphuric acid into it, it will not do for bakers; it will destroy the fermentation of the bread.

By Mr. Benoit:

Q. Do they not export molasses and sugar to Europe from the United States?—No; they are importing very largely. They do not produce enough for themselves.

A short time ago the Commissioner of Agriculture there stated, that judging by the progress that had been made, the Northern States, in a few years, would produce all their own sugar.

By the Chairman:

Q. Do you know of any other sorghum sugar factory in Canada besides your own?—They have been manufacturing it in Western Ontario; in the Niagara, or rather west of it, towards Detroit.

By Mr. Benoit:

Q. Did you notice in the papers that a company had started a sorghum factory at Niagara?—No; I did not. There was one at Tilsonburg; perhaps that is the one that you refer to. They have been growing sugar for years in the County of Essex, but they have been working it up in a very crude way.

Q. Is it still in operation?—Yes.

Q. What do you do with the refuse from the cane?—I should recommend its being used for manure.

Q. Then you have to cut it?—It is pretty well cut up when it comes from the crushing mill.

Q. We were unsuccessful with the sorghum in our county. Do you remember last year, that the frost came early.—Yes; but that frost also swept over the Western States, where both corn and fruits were destroyed.

Q. For two years it has been destroyed everywhere in Canada. I do not know whether, in view of that, you can say it is a very safe enterprize?—It is as safe as corn. In fact it is hardier than corn and will stand more frost than corn.

Q. Which, in your opinion, is the best way to manufacture it: at the large factories or at home?—I would recommend central factories, the same as cheese factories. If there were central factories the farmers could bring in their cane, but those who would have too far to bring it safely as cane, could make it up into semi-syrup. In the latter way it can be sent at any time to the factory, where it can be refined either into sugar or refined syrup.

Q. How can the cane be kept without souring?—You cannot keep it.

Q. It will not stand one night, according to my experience?—Every hour makes it less valuable. But the farmer, who lives too far from the factory, should have his own little crushing mill. With that he can crush out the syrup, which he then boils to a certain stage, and sends it to the factory where it it will be finished.

By Mr. Bain:

Q. What would be the smallest capital to put into a factory, to make it of any advantage?—It depends upon whether you are making only syrup. If you go to make sugar it will be much more expensive.

Q. Syrup is a simpler matter?—Yes; to make sugar it will take at least $10,000.

By Mr. Benoit:

Q. What have they done in that regard in the Western States?—They have factories there costing from $20,000 to $100,000—those large factories I have spoken of. In Minnesota they have small factories; they turn out a little sugar, but not much. I think if our Government would follow the example of some of the American States, and give a bonus, of say, a dollar for every ton of cane grown, and a cent a pound upon the product, in a few years we would produce a very large proportion of our sweetening requisites. The Government should also make it incumbent upon the factories receiving the bonus to impart such information to the farmers as would enable them to work up their product in a skilful manner.

Q. It would be an immense advantage if the farmers could get correct information, and see the process?—Yes.

Q. Which would be the more profitable for the farmer to grow, the mangold wurtzel or the sorghum, for the production of sugar?—Beets or cane? I think they would be about the same. I do not think there would be much difference.

By Mr. Bain:

Q. Have you had any experience with beets?—No; but I have looked into them as to the profits.

By Mr Benoit :

Q. What was the cost of the production of your 120 gallons of syrup ?—I could hardly tell you ; I had other things in hand at the time.

Q. Suppose a farmer cultivated an acre of sorghum, what would be the net profit ?—I could not give you the net profit to the farmer, because he does the work himself. I might give you the gross profits.

Q. What is the cost of producing an acre of sorghum ?—The way I would calculate the gross profits would be this: Suppose he takes his cane to the factory ; half of the syrup goes to the factory and half goes to the farmer. The farmer would have 60 gallons for his share ; it is worth 50 cents per Imperial gallon. That would give him $30 for his acre, besides which he would have twenty bushels of seed as grain, which would be worth 60 cents a bushel.

Q. You could not use the seed east of Montreal. It does not ripen ; some heads may, but a very few ?—Here it ripens without any trouble at all. Perhaps you have not the best kind.

Q. We had the Early Amber, from Minnesota ?—There is no trouble here. Last year it would not ripen here very well, but in 1882 it ripened perfectly. The seed, as I was saying, would be worth, say $10 ; that would be about $40 that the farmer would get as the profit on his acre. The expenses, of course, have to be taken out of that. Perhaps he would do the work himself, and perhaps he would hire.

Q. At what time do you sow your seed here ?—About the 15th of May.

By Mr. Landry :

Q. When extracting the syrup, the factory keeps half of it ?—The farmer gets half the syrup and all the grain.

Q. And how much do you charge by the gallon, when you are working by the gallon ?—I have never done anything in that way.

Mr. W. Hague Harrington, of Ottawa, called and examined.

By the Chairman :

Q. What experience have you had in the study of entomology ?—I have been collecting and studying insects for about ten years; and for several years have been upon the Council of the Ontario Entomological Society, and have assisted in preparing the annual reports of the Society for the Ontario Government, so that I have been forced in that way to go somewhat thoroughly into the study, and especially into the study of injurious insects.

Q. What do you know of beneficial insects ?—That is a question that requires a great deal of study. There are many classes of beneficial insects. For instance, we may take the *Neuroptera*—that is the order that embraces the dragon-flies. These are all beneficial insects; they prey upon the other insects. Then in the *Coleoptera* or beetles, there are large families that are insectiverous. These are principally the ground beetles, found usually on the ground, which may, if seen on a plant, be mistaken for destructive insects, whereas they are really preying upon the insects which are injuring the plant. A knowledge of entomology is necessary, in order to know the difference. Then in the *Hymenoptera*, which includes bees and wasps, there are a great many beneficial insects, especially parasites, which, in the larval state, feed upon the injurious insects. The wasps, which many people regard as injurious, are really beneficial, because they feed upon young caterpillars, upon spiders and other insects. They are really beneficial, though they occasionally may sting grapes or other fruit. The loss, however that they occasion is very little, compared with the good they do. In all the orders there are beneficial insects, as well as injurious ones. Among the *Hemiptera*, or bugs, though many injure plants there are also many which feed on other insects. It is hard, unless a person has a perfect knowledge of entomology, to know what insects are beneficial and what are not.

Q. Can our farmers do anything to increase the number of beneficial insects ? —They could do something if they knew the beneficial insects ; they could refrain, for instance, from killing those that are beneficial.

Q. Do you know of any beneficial insect which destroys the Hessian fly?—There are parasites which destroy the Hessian fly and also the wheat midge. The disappearance of the wheat midge is supposed to be the result of the operations of the parasite. There are probably minute parasites on all the midges and small flies, and upon their operations, to a certain extent, depends the scarceness or abundance of the insects in certain years. They help to keep them down. The cabbage butterfly is also kept down by a small parasite.

Q. Has a midge or Hessian fly-proof wheat been discovered?—Yes; I think it was in 1856 or 1857 that the midge was first introduced into Canada. It was introduced into the United States from Europe about the beginning of the present century, and it was very destructive in some parts of the States in 1854. In 1856 or 1857 it did great damage in Ontario; the damage to the wheat in one of those years was estimated at $8,000,000. But by the introduction of midge-proof wheat the damage was lessened, and of late years the midge has not been abundant. Mr. Arnold, of Paris, made experiments with midge-proof wheat obtained by hybridizing. There were certain varieties which were not touched by the midge owing to their hard covering, but these produced inferior grain. By hybridizing them with a wheat producing a good grain, he got midge-proof wheat, which, owing to the hardness of the cover, resisted the attacks of the larvæ. In the same way, to a certain extent, the Hessian fly has been dealt with, by getting a grain with a heavier stalk. The Hessian fly feeds in the joints of the stalk above the root; if the stalk is too hard for it, it cannot injure the plant very much. But as regards the Hessian fly, sowing the wheat very late in the fall is, perhaps, the principal method of dealing with it. It attacks the fall wheat principally. The eggs are laid just above the root, in the fall, and the larvæ feed in the root and in the stem. By sowing the wheat as late as possible in the fall, it would not grow sufficiently for the fly to do much damage to it.

Q. Would the amount that would be saved repay the cost of an entomological office in Ottawa?—Undoubtedly it would. It has done so in the United States. They have a very efficient Bureau there now. And although the Central Government maintains this Bureau at a comparatively large cost—from $20,000 to $25,000—a number of the States have their own entomologists. These States evidently find that it pays, or else they would do away with their own entomologists and avail themselves solely of the work of the Central Government. Instead of doing that, they are really increasing their entomologists. In the State of New York they had a very eminent man, from 1855 to 1872, the late Dr. Fitch, whose labours saved an immense amount of money, not only in New York, but in all the different States. They now, after being without an entomologist from 1872, have another one, a very superior man, indeed, Mr. J. A. Lintner; so that they at least see the advantage of having entomologists. Illinois, Missouri and other States have them also. If these individual States find it advisable to have State entomologists, we should consider it advisable in Canada, seeing that the conditions are even more different as between Canada and the United States than they are as between one State and another.

Q. What do you consider to be the average annual loss suffered, on account of the ravages of insects injurious to vegetation, in Canada?—There are certain crops that are almost wholly destroyed, I may say, at certain times. There are others which suffer from 5 to 50 per cent. If you were to average the losses at a very low estimate, they would amount to very many millions a year. If we were to estimate the total annual value of the agricultural products of Canada at $200,000,000, and then place the loss at 10 per cent., it would be $20,000,000. But I think 20 per cent. would be the very lowest to put the loss at, and 25 per cent. would be nearer the mark. If you place it at 20 per cent., $40,000,000 is the amount of the damage done by the insects. Now, during the past summer, the clover seed midge, a new insect entirely, completely destroyed the clover-seed crop of portions of Ontario.

By Mr. Landry:

Q. What order does that belong to?—It is a fly. It is called the *Cecidomyia leguminicola.* It was first noticed in 1878, in western New York. It received that name from Mr. Lintner, now the State entomologist of New York. Since then it

has spread very rapidly. In 1882 it was noticed as doing a great deal of damage in Western Ontario, in the vicinity of London. Last year it spread through nearly all Ontario. I think it was probably introduced in the seed.

Q. Does it destroy the white clover?—It feeds also upon the white clover, and that is one of the difficulties of exterminating it. Mr. Lintner, of New York, says it can be kept under by cutting the first crop of clover. In the State of New York they cut clover twice a year, in June for hay, and in the fall for seed. This midge, like the wheat midge, lays its eggs on the seed vessels, and the larvæ feed on the seed. By cutting the clover early, when the larvæ are young, you destroy all that brood, and then before the next crop is in flower the midge will have almost disappeared. So that, though the farmer would lose a small amount on the first crop by cutting it early, he would save, by the absence of the midge, on the seed in the fall. Then, I may say, that in the distribution of the clover seed, care should be taken. A person importing the seed should see that it does not contain the larvæ, because it will sometimes remain in the seed, or among it, during the winter.

Q. Does that insect attack the hybrid clover?—It will attack all clover. It is entirely new to science within the last few years, and, as we see, it has spread immensely, and has done very many thousands of dollars worth of damage in Ontario.

By the Chairman:

Q. Do you think beneficial results would follow the appointment of a Government entomologist?—Certainly. I think there can be no doubt of that, because a Government entomologist would have the time and the means to investigate all insects. He would be the first to hear of them appearing at certain points; and he would be the first to tell whether they were injurious or beneficial. By the publication of annual reports, and by the issuing of bulletins whenever any special insect attracted attention, he would do much good. For instance, there are insects that may be here in a short time. There has been found, in New York State, a small beetle which attacks the roots of the clover. This is, of course, an entirely different insect to the midge that works upon the seed. It is an imported beetle from Europe, and has only been lately noticed. It has been found to be very destructive. It so injures and weakens the roots that it is impossible to mow; the mower tears the roots out of the ground. Of course that may be greatly remedied by ploughing up the crop after the second year and rotating something with it. That insect may be found here in a short time; it has only to cross the St. Lawrence to reach us. In a case of this kind, a Government entomologist, being in communication with entomologists on the other side, would know the insect, and would be in a position to suggest the remedies to apply. Besides, if he thought there was any special neccessity for it he could issue a bulletin at once, as is done in the United States, with reference to any special insect.

Q. Do you believe that if the Government appointed an entomologist, and if a proper knowledge of entomology was diffused among the farmers, the ravages done by insects would be diminished?—Certainly. The farmers last year would have suffered much less loss through the attacks upon their clover seed had they known how to meet the insect. Why, if they had saved only one per cent. more of that crop, they would have suffered less by thousands of dollars. And one per cent. upon the entire crops of Canada, means two or three millions of dollars.

By Mr. Landry:

Q. What is the best remedy for that clover insect?—To cut the first crop early while the larva is young. By doing this the larva is killed in the grain and there is no second brood to attack the fall crops.

By Mr. Fisher:

Q. How early would it be necessary to cut it?—Soon after it is in flower. The midge lays its eggs as soon as the plant is in flower. Of course, the farmer must first look to see if the midge is laying in the plants. The midge is a very small insect but it is easily distinguished from other insects; it is smaller than the wheat midge, By examining the flower occasionally, if the midge has been there, you will see, when the larva are growing and that is the time to cut it. You must cut

it while the larva are young and still in the flowers, because if they are allowed to grow, they wriggle out and fall to the ground, where they pupate and when the clover is grown again they are ready to recommence their attacks.

By Mr. Landry:

Q. Does that insect lay eggs only once a year?—No; there are two or three broods. The first brood I was speaking of wriggles out of the seeds and drops to the ground, and after the lapse of a week or two the fly appears again. If there is another crop in flower they lay their eggs in that; indeed, as long as any clover is to be found in flower, they will continue to lay their eggs. The fall brood remains in the ground all winter. Sometimes it remains in the seed, and that is the way, no doubt, that it has been introduced into Canada. It is a small, reddish larva, and would not be noticed. In most insects the female dies almost immediately after laying the eggs and the perfect insect is comparatively short-lived. Of course the perfect insects do no damage, further than laying the eggs. The ravages are all committed while the insect is in the larval state—that is the reason why the farmer does not notice that damage is being committed—and when the fly appears the trouble is all over. I have not noticed these insects in this vicinity, but I have no doubt that next year will find them here.

Q. The insect is coming here, in your opinion?—It has spread through Western Ontario. It was very bad last summer around Toronto, and even east of Toronto it did much damage. A Government entomologist could make experiments regarding the movements and peculiarities of these insects, and could prescribe remedies for them. There is no doubt that a great deal of good has been done already by entomologists, in finding the best materials with which to destroy insects. Dr. Riley, the Chief of the Entomological Bureau of the United States, says, that the six chief remedies are tobacco, soap, hellebore, arsenic, petroleum and pyrethrum. The last is a powder which is deadly to insects, but perfectly harmless to man. It does not affect the higher animals at all. Arsenic, in its different forms of Paris green and London purple, has come into very extensive use, and is a good remedy against a great many pests, but it cannot be used on cabbages and some other crops, such as strawberries, without danger of poisoning. It is recommended very highly, however, by Mr. Saunders of London, for the codling-moth, which destroys so many apples. By syringing the trees when they are in flower, a small speck of Paris green lodging in the calyx will destroy the young grub when it comes out; and it cannot do any harm, because what lodges in the calyx is a mere speck and does not affect the apple afterwards. Mr. Saunders is a very large fruit grower and a chemist, and he states that there is not the slightest danger in using Paris green in this manner for the codling-moth, which has done so much damage through Ontario and has decreased the value of the fruit crop so enormously. Even the destruction of that one insect would repay the cost of an entomological station.

By Mr. Fisher:

Q. What about the other remedies you were speaking of?—Tobacco, soap and hellebore. It has been found, in regard to tobacco, that its vapor is far more injurious to insects, and far more powerful, than any application of smoke, or solution of tobacco. This is a remedy that can be very readily applied in greenhouses. The waste from tobacco can be purchased very cheaply and all that is necessary is to steam it.

Q. I suppose an entomologist for the whole Dominion could do work that would apply to all the different Provinces perfectly well?—I think so; because he would have correspondents all over the country. He could gather information in that manner, and wherever any special ravages were reported to him, he could inspect them personally. It requires a man of great experience, of course, to take charge of an entomological station. There are such immense numbers of insects, both beneficial and injurious, that it requires a great many years of hard study to become familiar with them. Some of the most destructive insects are so small as to require microscopical examination to recognize them. It therefore requires, as I say, a great many years of hard labor before a man is fitted to take charge of an entomological station.

Q Do you believe there are many insects in this country which are not to be found in the United States, insects which are not described by the United States Entomological Bureau, and for which no remedies have been prescribed?—Undoubtedly there are many. The insects, whose life histories are known, are small in number compared with those which have yet to be investigated. Besides, there is no telling what insect may at some future time become destructive, because as the conditions of the country change, the insects also change their habits to a certain extent. In this connection I may mention that many of the insects which infest our fruit trees, fed in their native state upon our forest trees. For instance, the apple borers, before apples were cultivated here, fed upon the hawthorn and juneberry. The potato beetle is probably one of the best examples of this. It was only when the potato was introduced into the section of country where it existed that it became injurious. It then left its native plant, because it found the potato more to its taste, and very soon spread all over America. In the same way there may be insects in Canada which only require certain plants to be introduced into their neighborhood to become obnoxious. When those plants suited to them reach them, they will seize upon them and may perhaps spread all over the country. It is impossible to say, at any particular time, what insect may or may not become injurious.

Mr. PHILLIP LANDRY, M.P. (Montmagny), called and examined.

By the Chairman:

Q. Is agricultural chemistry very useful in agriculture, and in what way?—There is no doubt that chemistry is very useful in agriculture, especially in giving analyses of the soil, analyses of plants, and of manures. In this way it shows the farmer what is missing from his soil, and puts him in a position to replace it. In fact, chemistry and geology, of all the different sciences, are the most useful in agriculture. By the aid of these two sciences, you can tell beforehand what may be the composition of the soil. In the soil, I may say, you have organic matters and inorganic matters; and by chemical analysis you find out, in a given soil, what its principal elements are. We know also by analysis what are the chemical elements of the different plants, and what are the elements of the different fertilizers and manures. By the aid of the sciences which tell all this, you can find what plants will succeed in a given soil, and what manure is necessary for a given soil.

Q. What do you understand by the ash elements of the soil?—The ash elements of the soil are the produce of the combustion of different plants. If you take a plant and burn it, you have in the ash that is left the mineral or inorganic elements that constitute the plant. These elements are drawn from the soil. They are mineral elements and will not burn, whereas the organic elements will consume and will form other combinations.

Q. What does the atmosphere supply to the plants during their growth?—The atmosphere supplies the plants with different gasses, but not directly. You have in the air nitrogen. This is given to the plants generally in the form of nitrates or nitric acid. The nitrogen is converted into plant food by the electrical influences in the air, chiefly after a storm. After a storm you will find a peculiar odor in the air, due to the presence of ozone. When the lightning crosses the air there is a great quantity of that ozone formed. Under its influence, a combination is made with the nitrogen of the air, and in that state it is furnished to the plants. It may, indeed, be carried down by the row to the roots of the plants, to which it is given. Then, the different plants themselves, by means of their leaves, breathe air, exhaling in the day-time oxygen. In the night-time the operation is reversed. Thus, in the night-time, we find that flowers in a bed-room or chamber are injurious, because then, instead of emitting oxygen, they emit oxide of carbon or carbon.

Q. How many pounds of ash ingredients do plants remove from the ground per acre?—That is rather difficult to say. It depends upon the character of the plant and the nature of the roots. The large roots, like turnips, remove more ingredients from the soil than the clover or the other plants which are used for forage.

Q. Do you know the quantity that beet roots remove?—I could not tell you the exact quantity.

Q. Would it not be about six hundred pounds per acre?—It ought to amount to about that figure.

Q. How do you explain the fact that land that used to grow wheat produces now only small crops of wheat?—I think one of the principal reasons is because the wheat takes from the ground the phosphoric acid and potash. These are the two principal elements that constitute wheat. They are the predominant elements in wheat. If you do not restore them to the land the crop must fail. In Quebec wheat has been grown for years and years in the same field and on the same land, and the elements thus removed have not been restored to the ground. Under these circumstances, the plant does not find the elements in sufficient quantities, and refuses to grow. In a rotation we have plants that are sympathetic or antipathetic with themselves or others. Wheat is one of those plants that become antipathetic with itself; that is to say, that after a certain number of years it cannot be grown in the same field, while other plants may be successfuly grown for years and years. Some plants will grow well after other plants, others will not.

By Mr. Fisher:

Q. Those that take the same elements from the soil ought not to follow one another?—No.

By the Chairman:

Q. Would a chemical laboratory be useful?—I think a chemical laboratory would be useful, and indeed of great advantage to farmers all over the country. We have here already geological surveys of the country which describe the aspect or the formation of the land in the various regions. I think we should have some attention paid to agriculture, with a view to the making out of the places where certain plants will grow with greater facility than others. The Dominion might be divided into regions, and a chemical analysis might be made of each. Then a general statement of the composition of the different parts might be made. In addition to that, if we had a chemical laboratory here, specimens of the soils could be sent to be analyzed here. Of course, that is a work which a farmer can do. While he may tell if there is any lime in his property, while he may make two or three simple analyses, he cannot make a quantitative analysis or say what proportion of any given element there is in his soil. If a chemical laboratory were established here, farmers could send specimens of their soil here for analysis, and then get a full knowledge of the composition of their own soil.

By Mr. Fisher:

Q. The difficulty in the soils is, that they vary very much; it is only in certain kinds of soil that you can get a large area of similar components?—That depends upon the geological formation of the land. In some places you meet with a large area having the same qualities throughout; in others, you may find different elements in one field. It depends upon whether the strata is horizontal or oblique.

By the Chairman:

Q. Is the preservation and employment of our animal manures very defective among our farmers?—Yes; very defective. Most of the manures are left outside in the open air. By reason of this, the sun dries up the gaseous matters from it, and the rain washes the soluble parts out of it. Thus the assimilable principles of the manure are completely lost. The way the manure is spread on the ground in some parts of the country is a great cause of loss, too.

Q. What have you to say about our phosphate mines?—I do not really know all the riches we have in the way of phosphates; but I think that a great deal of our phosphates could be utilized if we had the necessary apparatus to change it into superphosphates. I understand that a great deal of our phosphates are carried out of the country, changed into superphosphates and brought back again. I think if the Government would give a premium to encourage the establishment of factories to bring our phosphates to superphosphates, it would be a good thing.

By Mr. Fisher:

Q. In other countries they use sulphuric acid from other manufactures to make superphosphates; whereas, we cannot get the sulphuric acid cheap enough?—Yes.

By the Chairman:

Q. Do you think it would pay our farmers to employ superphosphates of lime?—I understand it is a very good article, especially in the production of turnips and wheat. In wheat, the predominant element is phosphate; and, no doubt, lands which contain little or none will benefit much by the use of it. But all these fertilizers should come in after manure. I think the farmer should produce part of all his own manure. By doing so he will save greatly; and, in addition, if he manages it well he will increase his produce by ten per cent. By the addition of what we call *terre noir*, peat muck, by properly working the manure, and by having a reservoir to gather up all the liquid for use, the farmer will profit greatly.

By Mr. Fisher:

Q. Do you not think the farmer can spend his money more profitably by improving his barn yard manure, than by purchasing artificial manure?—I think so.

Q. I think $100 laid out in feed, by which he can increase his barn yard manure, would be money better employed than $100 laid out in artificial manure?—Yes; because the artificial manures are wanted mostly every two or three years; they have a very short effect.

Q. And they are not always suitable to the soil, whereas the barn yard manure is sure to be?—Yes.

By the Chairman:

Q. Have you drained any portion of your land?—Yes.

Q. Did drainage make your lands more fertile?—Yes.

Q. To what extent?—I think I may say there was from 20 to 30 per cent. increase in the production. The drainage gives more heat to the soil. It removes the water which, under ordinary circumstances, in evaporating, attracts the heat and keeps it from the soil. It also destroys the obnoxious and injurious substances in the sub-soil. The rain coming down, drives these substances further down, so that the roots of the plant, instead of stopping in the sub-soil, penetrates deeper. Even in dry lands it has the result of sending the water deeper below them, and you have in store more humidity for the use of the plant. The drainage, however, must be pushed deep enough, so that the implements will not touch it when the soil is being worked.

Q. How many feet below the surface should the drains be laid?—I think under all circumstances drains should be laid at a minimum depth of thirty inches. It depends upon the soil to a large extent; but I think the minimum ought to be not less than thirty inches.

Q. Is drainage too expensive to be adopted by many of our farmers?—Formerly we used to make drainage of planks and stones, but now it is generally of tiles. Tile drainage at the first may appear a little dearer than the other systems, but it is the cheapest in the end.

Q. Do you know the cost of it?—It depends entirely upon the mode of drainage, whether you have a main drain and branches, or not, and the character of the soil.

By Mr. Fisher:

Q. Are you aware of any place in Quebec where tiles are made?—I think there is a place near Quebec, but I do not know.

Q. They could be easily made there, for there is plenty of clay there?—Yes.

Q. It would only need the market to create the manufacture?—Yes.

The Committee adjourned.

OTTAWA, March 12th, 1884

The Committee met. Mr. A. BLUE, Toronto, called and examined.

By Mr. Fisher:

Q. What is your official position?—I am Secretary of the Bureau of Industries for Ontario.

Q. How long have you been engaged in that work?—Since the latter part of 1881.

Q. Was that the first establishment of the Bureau?—Yes; I began the work of organization in 1881. The first work of the Bureau in making a report of crop statistics, live stock, &c., was in 1882.

Q. Does your Bureau of Industry include anything except statistics?—The scope of the Bureau is pretty wide. Perhaps I might read you the clauses of the Act which indicate its scope:—

"(3.) It will be the duty of the Commissioner to institute enquiries and collect useful facts relating to the agricultural, mechanical and manufacturing interests of the Province, and to adopt measures for disseminating or publishing the same in such manner and form as he finds best adapted to promote improvement within the Province, and to encourage immigration from other countries; and (amongst other things) to procure and publish early information relating to the supply of grain, breadstuffs and live stock in the other Provinces of the Dominion, in Great Britain and the United States, and other foreign countries in which the Province finds a market for its surplus products, and as to the demand therefor; and he shall submit to the Legislature, within thirty days of the opening of each Session, a detailed and succint report of his proceedings.

"(4.) The Lieutenant-Governor may appoint a Secretary of the Bureau, who shall be known as the 'Secretary of the Bureau of Industries;' and may also appoint such other officers as may be necessary for the proper conduct of the Bureau.

"(5.) It shall be the duty of the Secretary, under the instructions of the Commissioner, to conduct all correspondence of the Bureau; to send to the proper officers and bodies of whom such service is required the schedules, with instructions, approved by the Commissioner, for the collection of facts and information relating to the agricultural and other industries of the Province; to receive and tabulate the information collected and obtained; to publish the same monthly or oftener during the growing season; to prepare at the close of each year a general report to the Commissioner; to compile annually from the Departmental records of the Province, and from other available records, a tabular abstract of facts relating to land, trade, government, population and other subjects; and, generally, to perform all work within the sphere of the Bureau, as he may from time to time be directed by the Commissioner."

Those two sections indicate the general scope of the Bureau.

Q. Will you give us some idea as to how all that is worked out in the Bureau?—In the first place, as to crop reports, we have a number of correspondents in all parts of the Province—between 700 and 800 in all. There is generally one correspondent at least in every township, and in some townships there are two or three. The schedules of questions are sent out to those correspondents at different periods of the year. We generally begin with the first of May, and they are asked to report as to the condition of crops, the progress of seeding, harvesting, threshing, and marketing; the condition of live stock, and the presence of prevailing diseases—if any—among the live stock, with reports as to the nature and extent of those diseases. In addition to that, we collect statistics relating to the area of land occupied, of the land under crops, of the produce of the crops, of the number of different classes of live stock, and other information of that character.

Q. Have you any other mode of obtaining that information besides through these correspondents?—The information that I have spoken of respecting areas of crops is obtained direct from the farmers—not from correspondents.

Q. Do you send the schedules to every farmer for information?—Yes, to every farmer. The first year we adopted the plan of getting that work done by school teachers, taking the school sections as a unit. We sent the schedules to the school teachers and asked them to distribute them among the farmers in their section, with instructions to farmers to fill them up and return them to the teachers. The teachers tabulated the return for their school section and returned them to the Bureau, where the school sections were tabulated by townships and the townships by counties. That system worked very well, but a number of school teachers complained of

the extra work put upon them, and the system was changed last year, and we adopted, to its full extent, the English system; that is, receiving the returns, and tabulating them in the office.

Q. They are direct returns from the farmers in answer to the schedules?—Yes; this schedule we sent out last year, and it was returnable the 15th of June. You will see from it the information we collect direct from the farmers.

"A."

CIRCULAR TO THE FARMERS OF ONTARIO.

BUREAU OF INDUSTRIES, TORONTO, 1st June, 1883.

The object of this circular is to procure information for the second Annual Report of the Bureau of Industries. Last year the schedules were sent to farmers through the schools; and, when filled and returned to the teachers, school section reports were made up for the Bureau. There were some objections to this system, and there is reason to believe that fuller returns can by obtained by distributing and receiving the schedules direct, as in England. The return for each farm will, by this plan, be known only to the Bureau, and it will be treated strictly as confidential information, to be published in bulk form with all other returns for the county. I need hardly add that it has nothing to do with assessment, with taxes, or with party politics. The main object of the Bureau is to benefit the farmers themselves, by collecting and publishing useful facts about farms and farm-work, crops, live stock, etc. This benefit is chiefly two-fold.

(1.) By knowing whether there is a likelihood of abundance or scarcity of crops or stock, farmers have a good guide to prices. It often happens, for instance, that some kinds of crops are excellent in one part of the country and a failure in another part. Much depends on the rainfall, on local storms and drouths, and on weather effects generally. So, too, with the supply of fat and store animals. Farmers may have large numbers on hand, or they may have none to sell. Dealers know pretty well the state of the country in these respects, for it is part of their business to keep posted, and they have correspondents to supply them promptly with information. And so informed, they may, and often do, buy up the surplus grain, fruit, roots or live stock of a neighborhood before farmers know that there is either scarcity or abundance elsewhere to have any effect on prices. The Bureau, in collecting such information from all parts of the country and publishing it in special reports and through the newspapers, enables farmers to judge for themselves as to the course of prices, instead of selling or holding on in the dark.

(2.) By comparing results in their own and other countries, farmers are better able to judge of the value of their property, and less likely to part with it too cheaply, in the hope of getting richer lands and making fortunes easier elsewhere. Large numbers of Ontario farmers have sold out and gone to the North-West and to the Western States, no doubt believing that they were going to improve their circumstances by growing better crops. But it is more than doubtful if their expectations have been realized. Last year was a good year for grain crops in the United States, wheat yielding a bushel and a-half above the average. Yet the best States in the Union are found to be far behind Ontario in the staple grains. In Ohio the average of fall wheat last year was 16·7 bushels per acre; in Michigan, 17·8; in Illinois, 16; in Indiana, 15·7; in Missouri, 14·6; and in Kansas, 19·5. In Ontario, as shown by the Report of the Bureau, the average was 26·3 bushels per acre. The figures for spring wheat, barley, oats and rye are almost equally favorable, thus showing that grain-growing in Ontario must be considerably more profitable than it is in those States.

The knowledge of such facts as these must lead Ontario farmers to set a higher value on their lands, and make them less ready to leave comfortable homes here for a life of hardship on the prairies, where every stick for fuel and every board for farm-house or stable has often to be drawn a distance of ten or fifteen miles, and sometimes a great deal farther. Neither can it fail to draw the atttention of British

farmers who mean to emigrate, for the information gathered by the Bureau last year has already been extensively published throughout the British Islands. Farmers with means are likely to come to Ontario in larger numbers than ever before, and not only will farms fetch better prices, but Crown lands and lands held by speculators will be settled upon, waste lands will be brought under cultivation, and the agricultural wealth of the country will be greatly increased.

Some of the statistics of Ontario gathered by the Bureau last year will no doubt be interesting to farmers. The total area of land in farms was 19,622,429 acres, of which 10,218,631 acres were cleared. The value of farm land was $632,342,500; of buildings, $132,712,575; of implements, $37,029,815; and of live stock, $80,540,720; making the total value of farm property, $882,625,610. The area and yield of crops were as follows: fall wheat, 1,188,520 acres. 31.255,202 bushels; spring wheat, 586,817 acres, 9,665,999 bushels; barley, 848,617 acres, 24,284,407 bushels; oats, 1,375,415 acres, 50,097,997 bushels; rye, 189,031 acres, 3,549,898 bushels; peas, 557,157 acres, 10,943,355 bushels; corn, 206,924 acres, 13,420,984 bushels; buckwheat, 49,586 acres, 1,247,943 bushels; beans, 19,787 acres, 409,910 bushels; hay and clover, 1,825,890 acres, 2,090,626 tons; potatoes, 160,700 acres, 18,432,145 bushels; mangolds, carrots and turnips, 104,569 acres, 471,080,726 bushels; flax, 6,157 acres; hops, 2,051 acres; orchard and garden, 213,846 acres. Of live stock, there was 503,604 horses; 23,629 thoroughbred cattle (15,385 Durham, 1,438 Devon, 841 Herreford, 270 Aberdeen poll, 1,189 Galloway and 4,496 Ayrshire); 1,562,683 grade and native cattle; 933,143 coarse-woolled sheep over one year, and 676,362 under; 178,209 fine-woolled sheep over one year, and 127,499 under; 252,415 pigs over one year, and 597,811 under. There was also 310,058 turkeys, 533,357 geese, and 4,508,705 other fowls. The coarse-woolled sheep sheared 4,842,078 pounds of wool, and the fine-woolled 904,107 pounds. There were 471 cheese factories in the Province last year, and returns from 306 of these show that 25,562,431 pounds of cheese were made, worth $2,767,085. The extent to which underdraining is carried on is shown by the fact that one-third of the tile-yards in the Province, from which returns were received, made enough tiles last year to lay more than 1,000 miles of drain-works.

In filling the schedule below it is scarcely necessary to give any explanations. The acreage of fall wheat and of orchard and garden has already been collected by the assessors, but in case any portion of the wheat crop has been ploughed up or re-sown with other grain, it will be necessary to say how much. *Be careful to give your name, county, township, and post office in the blanks for these*, and answer all the other questions to the best of your knowledge. The value of property should be its *real* value, not the assessable. As to thoroughbred cattle, a word of caution may be necessary. None should be entered as such unless they are entitled to herd book registry. Where a farm is leased, the return should be made by the tenant. The rent value of leased farms should only be given by the owners or tenants of such.

Tear off this circular along the perforated line and retain it. You may find the figures useful for future reference. *Fold the schedule as it has been folded, so that your name and address may be seen at once;* enclose it in the accompanying envelope, and send it to the post office on or about the 15th of June inst. If not sealed it is postage free.

A. BLUE, *Secretary.*

SCHEDULE FOR 1883. FILL UP AND RETURN ON 15TH JUNE.

Farmer's Name.....

Be careful to fill in these blanks along the dotted lines.

County.....

Township.....

Post Office.....

1. Number of acres in farm, ...
2. Number of acres cleared, ...
3. Acres of fall wheat ploughed up or re-sown, ...
4. Acres in spring wheat, ...
5. Acres in barley, ...
6. Acres in oats, ...
7. Acres in rye, ...
8. Acres in peas, ...
9. Acres in corn, ...
10. Acres in buckwheat, ...
11. Acres in field beans, ...
12. Acres in flax, ...
13. Acres in hops, ...
14. Acres in hay and clover, ...
15. Acres in potatoes .....
16. Acres in mangold wurtzels, ...
17. Acres in carrots, ...
18. Acres in turnips, ...
19. Acres in vineyard, ...
20. Horses:
    1. Number of working horses, ...
    2. Number of breeding mares, ...
    3. Number of colts and unbroken horses, ...
21. Thoroughbred cattle:
    1. Durham, milch or breeding cows, ...Others.....
    2. Devon, milch or breeding cows, ...Others.....
    3. Hereford, milch or breeding cows, ...Others.....
    4. Aberdeen poll, milch or breeding cows, ...Others.....
    5. Galloway, milch or breeding cows, ...Others.....
    6. Ayrshire, milch or breeding cows, ...Others.....
22. Grades and native cattle:
    1. Number of working oxen, ...
    2. Number of milch cows, ...
    3. Number of store cattle over 2 years, ...
    4. Number of young and other cattle, ...
23. Sheep:
    1. Number of coarse woolled over 1 year, ...
    2. Number of coarse-woolled under 1 year, ...
    3. Number of fine-woolled over 1 year, ...
    4. Number of fine-woolled under 1 year, ...
24. Pigs:
    1. Number over 1 year, ...
    2. Number under 1 year, ...
25. Poultry:
    1. Number of turkeys, ...
    2. Number of geese, ...
    3. Number of other fowls, ...
26. Wool:
    1. Number of fleeces coarse wool, ...
    2. Weight in pounds, ...
    3. Number of fleeces fine wool, ...
    4. Weight in pounds, ...
27. Bushels of old wheat on hand, ...
28. Pounds of maple sugar made this year, ...
29. Pounds of butter made last year, ...
30. Rods of under-drain completed on farm, ...
31. Value of farm property:
    1. Value of land, $.....
    2. Value of buildings, $.....
    3. Value of implements, $.....
    4. Value of live stock, $.....
32. Rent value of farms per acre, $.....
33. Wages of farm hands:
    1. Per year, with board, $.....
    2. Per year, without board, $.....
    3. Per month in working season, with board, $.....
    4. Per month in working season, without board, $.....
34. Wages of servant girls, per week. $.....

Q. And one of these was sent to every farmer so far as you could, in the Province?—Yes.

By Mr. Massue:

Q. Were they sent through the agricultural associations or directly to the farmers?—Directly to the farmers.

By Mr. Fisher:

Q. What proportion of answers did you get to the number of schedules you sent out?—We got about one-third; a little over one-third, I think.

Q. Were the schedules well filled up on their return?—Very well, on the whole. We got quite a sufficient number to make a perfectly safe average. We got a return covering between 7,000,000 and 8,000,000 of acres of land, and every township in the Province was fairly represented in the return. Then, of course, we estimated for the whole Province on the data of land cleared or occupied furnished by the returns. I should say that we got from the township clerks, a return of the acreage of land in each township assessed—that is, the total acreage assessed, the acreage of land cleared and the acreage of swamp, marsh, or waste land, the acreage of fall wheat, and the acreage under orchard and garden crop. The assessors begin their work usually about the 15th of February, and they are obliged by law to make their returns to the Township clerk into later than the first of May.

By Mr. Bain:

Q. Then you got these returns from the clerks for that season?—Yes.

Q. They furnished them to you direct?—Yes.

By Mr Fisher:

Q. Are they required to do so by the municipal law of the Province?—Yes; they are required to do so by section 6 of this Act, which reads as follows:—

"(6.) The officers of all societies, institutes and associations organized under the Agricultural and Arts Act, and of all municipal councils, school boards and public institutions, and all public officers of this Province, shall promptly answer all official communications from the said Bureau; shall, from time to time, collect and tabulate facts, according to instructions to be furnished them; shall make diligent efforts to supply correct information on all questions submitted to them; and generally shall act, as far as practicable, upon the recommendation of the Commissioner; and any officer of any such society, institute, association, council, school board, or public institution, making a false return of information, or refusing or wilfully neglecting to answer any question, or to fill up, tabulate and return official schedules according to the instructions and within the prescribed times, or to furnish any information relating to the industries of the Province, when required to do either by the Commissioner or the Secretary of the Bureau, shall for every such offence incur a penalty of forty dollars, which shall be recoverable by any person suing for the same before any court of competent jurisdiction, and shall be paid to Her Majesty for the use of this Province."

That refers only to officers of bodies incorporated under the Provincial Statute, and it is only to that extent that the operations of the Act are mandatory. The information we ask from our farmers is given voluntarily on their part. Many farmers, however, I have no doubt, hesitate to give the information, fearing that it has something to do with local taxation. Of course, we anticipated that before. It has been met with in every country where similar statistics have been collected.

Q. Can you give us a short outline of the information which you obtain in this way; what ground will your statistics cover? You have, to a certain extent, answered that question already, but perhaps you could state it a little more definitely?—In the special report of the Bureau we make a digest of the information given to us by our correspondents.

By the Chairman:

Q. Do you make enquiries respecting the ravages of insects?—Yes; and also with respect to drainage and the prevalence of noxious weeds, and any other matter of special interest to farmers.

By Mr. Fisher:

Q. Can you tell us what expenditure is requisite to maintain the Bureau?—In the first year the staff was not fully organized, and the expense was a little under $8,000. Last year it was considerally more, owing to the change of system. We had to employ a much larger staff of clerks to tabulate the returns. You can understand that 50,000 returns of this nature coming in, involve a great deal of work in the tabulation. We employ a number of extra clerks, for a couple of months, to carry on that work. In addition to that, a large number of reports were printed for circulation among the people, with the object of informing them as to the character of the work we were doing, and a large number, also, were sent to the old country, to be distributed there by the immigration agents. We also collect statistics of the dairy industries of the country, especially of cheese made in the cheese factories.

Q. You also obtain information in the schedules in regard to private dairies, do you not?—No; that is not asked for there. We ask for the quantity of butter made in the preceding year.

Q. How do you disseminate through the country the knowledge which you thus obtain?—Every correspondent of the Bureau is entitled to a copy of the report. We also send copies of the reports to the Granges, officers of agricultural societies, municipal clerks, and to nearly all public officers in the Province; but in addition to that, we make out a summary of each report, giving all the leading facts that it contains, on printed slips, which are sent to every newspaper in the Province simultaneously. We give no advantage to one newspaper more than another; all are served alike.

Q. How frequently do you issue these reports?—In the first year we issued five special reports—in May, July, August, September and November. Last year we issued three—in May, August and November. The May report gave an account of the condition and the area of the land under fall wheat, the condition of live stock, the state of vegetation at the time, also the area of land assessed and cleared, and the area under orchard and garden, prepared from the returns made to us by township clerks.

Q. Are you able to get this information to the public pretty soon after it is obtained?—In the case of the schedule sent to the farmers and returnable on the 15th of June, we have are port, giving the areas of all grain crops, together with estimates of the produce, issued about the 10th or 12th of August.

Q. That is, in about two months?—Yes; but before any grain is marketed.

Q. You do not issue any monthly bulletins or slips, that are distributed generally through the country?—Not monthly, but just as often as we issue reports, our bulletins are summarized from the reports. In the November report we give the complete tables of crops and live stock, with the various estimates of produce. Our estimates of produce are based on the returns made to us by threshers and correspondents, from actual results. This is the same system as is adopted in several States of the American Union, where they have State Bureaux.

Q. Do you keep any statistics of weather and seasons?—Yes; we have statistics of sunshine, precipitation and temperature. These are furnished to us under an arrangement made with the Meteoroligical Office at Toronto. The Meteorological Office, in 1881, I think, had about 55 rain-guage stations in Ontario. I secured the establishment of a large number of other stations, so that now we have returns from 150 rain-guage stations in Ontario. The Government of Ontario also furnished the Metorological Office with eight additional sunshine registers. The Office had two in the Province previously—one at Toronto and one at Woodstock. In that way we get a complete record of the sunshine in the Province. We also have reports of the temperature from the ten stations.

Q. In what way have you noticed that the agricultural community benefits from this statistical work, or in what way do you expect it chiefly to benefit them?—I think it may benefit them in a variety of ways. It gives to the whole people—producers, dealers and consumers—a knowledge of the extent of supply and demand in the country, and in that way it serves to check the operations of speculators. There are a few leading men in the country who buy up nearly the whole produce of the country. They have their agents, their buyers, all over the country. They are constantly in receipt of information from them, as to the condition and prospect of that crop, and they are able, at the earliest possible time, to avail themselves of the information colected in this way. It is not an uncommon thing for them to buy up nearly the whole available surplus of produce, before the farmers generally have an opportunity of knowing whether or not there is an excess in the supply, or whether the tendency of prices is upwards or downwards. We collect this information, and as we have as wide a circulation, at least as the dealers have, we are able to give it to the people just as early as the dealers can procure it. To give you an instance of what may be done, I would refer to the crop reports of the United States Bureau for 1873. You may remember that in 1873, as in 1883, the fall frosts were unusually early and severe, and they destroyed to a large extent the corn crop of the country. The report of the United States Bureau of Agriculture showed that the extent of the damage done in that year was at least 125,000,000 bushels of a loss to the corn crop, and almost immediately after the appearance of that report the price of corn went up 20 cents. In that case, the farmers got the benefit of the rise, and not the speculators, and I hold that it is the farmers—the producers, the men who earn—who should receive the full advantage of high prices, and not the speculators. The consumers will not be benefitted in any way by the speculators buying low, for the speculators and the dealers will sell high if the market justifies it. Then in the year 1879 again, there was a large crop of wheat in the United States, and the leading dealers in Chicago and New York, having been posted

as to the condition of wheat in Europe, and knowing that the crop was a failure there, bought up nearly the whole supply of wheat in the United States—the fall wheat—at 90 cents a bushel, and almost immediately afterwards it rose to $1.20. A similar attempt was made in 1881, but it was foiled through the efforts of State Bureaux, several of which had in the meantime been established—in Illinois, Ohio, Michigan and several other States. Through the information which those reports were able to give to the public, the farmers were induced to hold their grain, and they sold it at the highest price. The Secretary of the Ohio State Board of Agriculture, who was at the head of the Bureau of Crop Reports there, estimates that in this way the farmers of the State got an increased value on their wheat crop, amounting to not less than $10,000,000. Of course, if this information had not been communicated to the people—if it had been collected and held by the large grain dealers for their own special use—that profit would have gone into their profits. As it was, it was distributed among the farmers, and it enabled them to carry on improvements on their farms, to put up buildings, and drain their lands, and so improve their condition. I remember—I think it was in the same year, 1881—that there was a failure in the bean crop in our own country, in the County of Essex especially, where the bulk of the bean crop in Ontario is grown. The grain dealers knew this. There was also a failure in the same crop in Michigan and New York. They set to work and bought up nearly the whole of the bean crop that year before it was harvested, at prices ranging from $1.25 to $1.75 per bushel, and in less than a month beans were quoted in the Detroit market at $3 per bushel. Those dealers made a profit and the farmers lost it. We seek to give to the public the information which only grain dealers and speculators generally are able to procure for themselves, and which they do procure at a very large cost. Then there are other ways in which we hold that agricultural statistics are of value to the country generally—they encourage the keeping of farm accounts, for if farmers are to make proper returns to the Bureau, they will be obliged to keep some kind of accounts. That itself is a very important thing. Then they direct dealers where to procure supplies, of store cattle for instance, or any kind of grain or root crops; they give a basis of certainty on which to compute the country's surplus produce, and they serve to prevent panic or unnecessaay fluctuations in prices, by making known exactly what the extent of the supply is in the country. By showing the probable extent of employment in the carrying trade, shipping and railway interests are enabled to make timely provision for it. They mark the tendency to overcrop and impoverish the soil, and demonstrate the value of fertilizers and improvements and reform in tillage. In recording the resources of the country, its capabilities and progress in material wealth, they serve to attract population and capital from other lands. They enable us to compare different places at the same time, and the same place at different times. I may say that our country has suffered very considerably in its reputation in the past, through the want of such a system as this, for we have had no other means of collecting such information than the Census, taken every ten years. Now the Census of 1871 gave the returns for a very bad harvest. The average production of fall and spring wheat for the Province of Ontario in that year was about ten and a-half bushels. That fact was used to our detriment in the old world, by the immigration agents of the United States. They showed how small our average was, compared with their own, and the inference was that our country must be a very poor one for agricultural purposes, and that it was a country to be shunned rather than a country to emigrate to. Now the same thing may happen at the taking of every Census. It may be a poor harvest each time, and it is only by the collection of such statistics annually that you can really show what the capabilities of the country are. According to the statistics which we collected in 1882 and in 1883, it its clear that in its agricultural resources, our Province of Ontario compares very favorably with the best State in the American Union. It may perhaps interest the Committee if I read you a table which I have prepared of the average produce of the leading grain crops in those three years. Our estimates of the yield of grain and root crops are collected

much in the same way as theirs, and so far as their reliability goes, ours is, to say the least, quite as reliable as theirs. My own opinion is that it is more reliable, more accurate. Taking fall wheat, I find that the following is the average yield per acre in Ontario, and eight of the principal fall wheat growing States of the Union, during the years 1882 and 1883 :—

	1882.	1883
Ontario	26.3	16 6
Ohio	16.7	9.5
Michigan	17.8	12
Indiana	15.7	10.4
Illinois	16	10
Missouri	14 6	12
Kansas	19.5	17
New York	18.7	11
Pennsylvania	15.5	13.5

I take the figures of the American yield from the report of the Department of Agriculture at Washington. The yield of spring wheat during the same years in Ontario and those States where spring wheat is grown, is averaged as follows :—

	1882.	1883.
Ontario	16.5	16.6
Iowa	11	12.7
Minnesota	13.3	13
Dakota	16.7	16

The average returns for the barley crop for those two years, according to the statistical returns, were :—

	1882.	1883.
Ontario	28.6	24.3
Ohio	19.9	21
Michigan	25.2	21
Indiana	24	20.4
Illinois	22.5	26
Missouri	23	22
Kansas	25.7	21
New York	25	24.5
Pennsylvania	23.5	25
Iowa	21.7	23.6
Minnesota	23.3	24
Dakota	29.2	38

I find the following are the average returns of the oat crop in the years named :—

	1882.	1883.
Ontario	36.4	38.5
Ohio	28	34
Michigan	33.3	36.7
Indiana	27	30.5
Illinois	37.4	33
Missouri	34.5	30
Kansas	38.1	41
New York	34.2	32
Pennsylvania	27.8	33
Iowa	31.8	36
Minnesota	40	37
Dakato	45	34

In the same way the average yield of the rye crop is as follows:—

	1882.	1883.
Ontario	18.7	16
Ohio	15.8	13.7
Michigan	17	12
Indiana	15.1	11.5
Illinois	16.6	15
Missiouri	15.5	11
Kansas	22.3	16
New York	16.2	14
Pennsylvania	15.8	14
Iowa	14.3	15 5
Minnesota	18	16 5
Dakota	20	18.7

These figures have been a surprise to some of our own people, and they have certainly been a surprise to the Americans, especially to those Americans who are employed in the same work as myself. They had formed an opinion as to our agricultural capabilities from the census return of 1871.

Q. Can you give any information in regard to the working of Statistical Bureaus in other countries that would show any difference in working from your own?—Well, that is a pretty large question.

Q. I mean, more in the management of the Bureau, perhaps, than in its results? Perhaps then, in the first place, I may refer to the English system, upon which ours is largely based. In England the first statistics were collected in 1866. It had been a subject of discussion in Parliament for a period of thirty years. Successive bills had been introduced dealing with the subject, but one after another was defeated; however, the rinderpest broke out in that country and it was suggested by the Government that it would be necessary to take a census of the live stock of the country in order to carry out the provisions of the law enacted to deal with that disease. The law provided for compensation to farmers for animals slaughtered to prevent the spread of the disease. The farmers seeing that it was in their own interest, and having opposed the measure strongly for many years before, at once fell in with it, and they gave very full returns. In the course of the same year they were asked to give returns of the acreage of crops, and as to the areas generally. They did so, and the system has been in operation very successfully there ever since. The schedules there are sent to the farmers through the officers of the Inland Revenue Department, the mail service of the country being placed at their disposal. There are a very large number of Inland Revenue officers throughout the service in England, and they are utilized to distribute the schedules to the farmers. The returns are sent to the Board of Trade in London, where they are tabulated, and a summary of the report is prepared generally about the middle of August. The returns are collected there on the 5th of June. The same system has been in operation in Scotland, and they find that every year the number of those who refused to give information—to fill up the schedules and return them to the Government—is growing less as the prejudice against the system dies out. In Ireland they have a very complete system. There the statistics are collected by officers of the Royal Constabulary Force. Being in the employ of the Government they collect those statistics as a part of their regular duty, and they get no extra pay for doing that work. They collect, in the first place, the area of land in holdings, with the extent of each holding; the areas of the different kinds of crops, the numbers of live stock, and so on. Afterwards they obtain estimates from the farmers of the average production of grain crops, after the threshing season has commenced, and areas and produce of all crops are also embraced in their returns. In France they have a very complete system, carried on under the Department of Agriculture. Every municipality makes a return through one of its municipal officers to the Government—the returns are

monthly, I think—and this information is tabulated and given to the Department. A somewhat similar system prevails in Belgium and Holland. There the facts are collected by the large landholders, who hold some municipal office usually, and they are published by the Governors of the Provinces. In Hungary there is also a very complete system, and also in Austria and Austro-Hungary. In Germany they have had a system in operation for a great many years. Prior to the consolidation of the Empire, in 1871, each State of the German Confederation had its own system, and in 1870, a convention of statists was held, at which they organized a Federal scheme in connection with the State scheme. That system was adopted by the Empire, and it still continues. Each one of the old States continues its own system of collecting reports, and it makes a return to the General Government. I think all the European States have more or less perfect systems for the collection of such statistics. In Australia they have also done very good work, especially in the Province of Victoria. In that Province the assessors of the municipalities collect the information when they go their rounds each year, and they send the returns direct to the Provincial Secretary. They leave a schedule, in the first place, with each farmer. The farmer is required to fill it up and send it, as evidence that the assessor has left it with him. The work is then tabulated by the Government officers. The system costs nothing to the Province—that is, the system of collecting statistics—because the municipalities are subsidized by the Government, and if any municipality refuses to give the information, the Government has authority to appoint an officer to proceed to collect that information and charge it to the municipality, and withold the subsidy in the meantime. In the United States the system of collecting agricultural statistics was established, I think, in 1862, and it has been in operation there ever since. They have, on an average, one correspondent in every county in the Union, and each of these correspondents has two, or three, or four men, who report to him, and from their reports he prepares a report, which is transmitted to the Department at Washington, where it is tabulated. In the past this system has been largely a system of guess-work. I do not know where they have got their statistics of the acreage of land under crops, unless it has been computed from the census returns of the produce of grain, for until the census of 1880, the area of grain crops was never collected in the United States. I think that matter is a very grave defect, for I regard a return of the area of grain crops as a very necessary factor in any system of agricultural enumeration. To show you how wide of the mark their estimates are, I will compare the returns made by the United States Bureau of Statistics for the crop of 1879 with the census returns. For corn, the report of the Department of Agriculture for 1879 gave the total production as 1,547,901,790 bushels; the census return placed the figures at 1,754,861,535, being a little more than 200,000,000 above the report of the Department. The area under crop in that year, according to the report of the Department, was, in round numbers, 53,000,000 of acres; according to the census it was 62,000,000 acres. Of wheat we find that the produce was estimated by the Department for the year 1879 at 448,000,000 bushels; according to the census it was 459,000,000 bushels. That was very close. According to the Department the area under wheat crop was 32,500,000 acres; according to the census it was 35,500,000 acres. The produce of rye for the same year, according to the Department returns was 23,639,000 bushels, from an acreage of 1,625,000 acres. According to the census the produce was 19,831,595 bushels, from an area of 1,842,303 acres. Take oats next; the produce according to the Department was 363,761,320 bushels, from an area of 12,683,500 acres. By the census the total produce is given at 407,858,999 bushels, from an area under crop of 16,144,593 acres. Then take barley. The total produce of the year 1879, according to the Department, was 40,283,000 bushels, from an area of 1,690,700 acres. According to the census the produce was 44,113,495 bushels, from an area of 1,997,717 acres. The yield of buckwheat, according to the Department, was 13,149,000 bushels, from an area under crop of 639,000 acres. According to the census the produce was 11,817,327 bushels, from an area of 848,349 acres. Thus, you see there is a very wide discrepancy between the actual figures collected by the census and the figures as given by

the Department. I am not wholly surprised that there was such a wide discrepancy, considering the system adopted by the Department.

Q. You think the system you have in Ontario is very much more accurate than the American system?—Yes; more accurate in this respect, that we can get the areas of crops. But in a number of the States they collect areas of crops now year by year—in Illinois, Ohio, Michigan, Kansas, Missouri, and I think in Iowa. The assessors go their rounds in the month of May. They collect the area of land under the different crops, and their reports are made either to the State Bureaus or to the Secretary of State. These are at once used in the preparation of the reports. The Department of Agriculture at Washington is now availing itself of the work done by the State Bureaus, and as far as possible, it has, for the past two year, been collecting the area of land under crops. Their statistics now are, I think, much more accurate than they were four or five years ago. It is possible that the Department was not as well managed four or five years ago as it is now; in fact, I am satisfied that it was not. The old statistician was removed for political reasons, but he has since been restored to his place, and the new Commissioner, Dr. Loring, a man of very great ability, is in charge of the Department.

Q. Does the Federal Bureau in Washington make use of the State Bureaus?—Yes. In 1882 the Department of Agriculture obtained a grant of $100,000 from the Government to aid them in carrying on the work more efficiently. This has been expended in utilizing the State Bureaus, and a secretary has been employed in each State to report for the same. The Federal Government subsidized the State Bureaus to that extent.

Q. Can you give us any idea how a Federal Bureau could be established in this country, and what its advantages would be?—I think a good deal could be done in the way of making a Federal Bureau of service in this country. It would simply be the carrying out, or the application of, the Federal idea to the system of collecting all those statistics regarding crops, live stock, &c. The work of collecting statistics, I am convinced, however, can be more accurately done by the Provinces than by the Federal Government. They have machinery which is wanting in the Federal Government—such as municipal and school laws, and other agencies of that sort. But it would insure an earlier publication of the results, which is a very desirable thing.

Q. Do you mean that the Federal Government would be able to publish earlier returns, or the Local Government?—I mean that by retaining the local Bureau you would obtain a much earlier publication of the results. Each Province prepares its own report, and the results may be given to the public for that Province. But under the Federal system that would have to be communicated by all the Provinces to the Federal Government, there to be tabulated, and the results would be given of the whole Dominion.

Q. You think it would be better to keep up the local Bureaus themselves, and have them to publish their own provincial statistics, and then the Federal Bureau could collect the statistics from the whole of the Provinces and tabulate them for the Dominion?—Yes; the provincial Bureaus could be utilized for that purpose.

Q. You think the publication of statistics for the whole Dominion would be a benefit to the Dominion over and above what benefit the Provinces would obtain from their own provincial Bureaux?—I have no doubt of that.

Q. Could you give us an idea of what you think such a Federal Bureau would cost, when operated in conjunction with the provincial Bureaus?—That would depend a good deal on the local organization of the several Provinces. Except in Manitoba, I do not think any Province has such a complete local organization as Ontario has. If that work could be done properly in the provincial Bureaus, and the results given to the Federal Bureau, I see no reason why such a Bureau could not be carried on at a cost, at the outside of $10,000 per annum.

Q. For the Federal Bureau?—Yes. Of course it would require the services of two very good men, and they should be good men.

Q. Would not the establishment of such a Bureau as that very much decrease the cost of collecting the census returns when that work comes to be done?—I do

not think it would decrease the cost of taking the census very much. It would, however, give us the information which we wait altogether too long a period of time for, now to get from the census.

Q. You think it would not have any influence upon the present cost of taking the census as it has been done heretofore?—I do not know that it would, but it would give us the information much more compactly than we usually get it. Perhaps you will let me read an extract from an authority which I think all will respect. I read from a speech made by Commissioner Loring, at an agricultural convention held in Washington in 1882. It was made following a paper read by Mr. Chamberlain, the Secretary of the Ohio State Board of Agriculture. Mr. Chamberlain, in that paper, urged the Central Department of Agriculture for the United States to utilize the work done by the State Bureaus. Commissioner Loring said:

"Now I think there can be a union between this Department and the State Bureaus for statistical purposes—a valuable, reliable and important union. So convinced have I become of this that I have already presented an estimate to Congress for ten times the sum usually asked for for this work. Usually there has been appropriated $10,000 to the statistical branch of the Department. But I trust this matter may be presented to Congress in such a strong light that there will be no hesitation in increasing this insufficient sum. In the estimate I made for the succeeding fiscal year, I have asked for $100,000."

Then he goes on to say, in reference to Mr. Chamberlain's paper:—

"It has convinced me, and I trust it has convinced every member of this convention, that the statistician of this Department can put himself in immediate communication with the statistician in each State of this Union where there is one. There is no reason why statistical information should be collected for this Department and paid for by the State of Ohio, for instance. On the contrary, there is every reason why the General Government should employ persons in Ohio to furnish facts and figures that will be of use to the whole country, and while the statistical branch of this Department, in securing all those commercial facts to which the paper has alluded, and all facts relating to foreign crops and commerce, a proper combination between the States themselves and this Department will secure all the rest of the information we so desire."

By the Chairman:

Q. According to your statistics, have you ascertained that any crops in Ontario have been in excess of the home consumption, and how many? Has the fruit crop been in excess of home consumption, and have the Ontario farmers had to look to any foreign market for fruit?—The Bureau has not been long enough in operation to determine that question. The fruit crop has been a failure both years. In 1882 it was a failure in the western half of the Province, the circumstance of which was partly due to the extreme cold of the spring, and partly to the blight that affected the trees during the summer. In the eastern half of the Province, although the cold last spring had its effect, the crop was a very fair one, and the farmers were enabled to realize good prices, largely, I have no doubt, through the early information which the Bureau is enabled to give of the condition of the crops in all parts of the Province. A man may know what condition the crop is in in his own immediate neighborhood, but he cannot know what it is ten or twenty miles away, not to mention the extreme end of the Province.

By Mr. Bain:

Q. Is there any other branch of information which occurs to you, that we have not asked for?—There is a good deal to say, but what I have said relates chiefly to the collection of agricultural statistics.

The Committee adjourned.

MARCH 14, 1884.

The Committee met, Mr. GIGAULT in the Chair. MR. STEWART THAYNE, Ottawa, called and examined:—

By the Chairman:

Q. Have you paid much attention to timber culture?—Yes; I have devoted many years to the exclusive study of the question. I had a special interest in it for years, while holding the editorship of a paper exclusively devoted to timber products.

Q. Did you attend the American Forestry Congress, on behalf of the Province of Quebec?—I had the honor of doing so; the Congress included representatives from different parts of the continent.

Q. Are you acquainted with forest management outside of Canada?—Yes; I have visited most of the great forests of Europe, have studied their management, and have devoted considerable attention to their resources, with a view to ascertaining how long the supply would be likely to last. My reason for doing so was that the lumber trade of England amounts to from $80,000,000 to $100,000,000 per annum in foreign woods; it was consequently of the utmost importance that we should know how long foreign countries would be able to supply the demand, and what danger there was of the supply running short.

Q. Have you studied forestry in its relation to agriculture? How does the former affect the latter?—It is impossible to study forestry without touching upon its relation to agriculture. Both are intimately connected with each other. The failure of the one—that is the denudation of a country of its forest trees, means, if not the destruction, at least, the greatest possible injury that can be inflicted upon the agriculture of a country. It is not necessary for me, in order to prove this, to go over what has occurred in ancient times, when some of the most fertile regions in the world were reduced to barren wastes. We can see instances of this in modern times and within the memory of living man. There is an instance in the south of France where whole districts have been depopulated. This was owing to the fact that the shepherds on the slopes of the mountains cut, not only the large wood, but all the small wood for fuel. As a consequence, the soil was thoroughly exposed to the rain, and the torrents swept the whole surface soil down into the valleys beneath. Not only was the pasture land on the slopes swept off, but such enormous amounts of soil and such immense rocks and boulders were swept down, that devastation was carried into the fertile valleys below. It is found now that the injury done in those districts can only be repaired at an immense cost.

Q. Is the preservation of our woods a matter of importance to Canadian agriculturists?—In this country it is very important that the woods should be preserved, more important, I should imagine, than in the more moderate climates, where you do not meet with the extremes of heat and cold. If you destroy the vegetable barrier which you have to the north, and which breaks the force of the Arctic winds, you expose yourselves to severe storms of cold. Then it is known that when the forests are once removed the evaporation is much more rapid than it otherwise would be, and you rush from one extreme of weather to the other. The influence of forests upon the climate of a country is to equalize the temperature. Another point worthy of consideration is the fact that where you destroy the forests of a country, you also decrease the water supply. Now, for instance, the effect of disforesting the whole of the Ottawa district would be at once to dry up all those small lakes, rivulets and streams which flow into the main river. Of course, practical agriculturists can at once understand what effect that would have upon the whole region; it would be simply to render it comparatively worthless for farming purposes.

By Mr. Massue:

Q. Have you any suggestion to make in the direction of planting trees?—Do you mean on a large scale?

Q. Yes?—I think that in the lumbering section planting on a large scale is still unnecessary, as the young growth in the districts which are not settled would replace the old if allowed. I would not say, in its pristine vigor, but at any rate to an extent

that would answer the requirements and commercial purposes of the country. But, of course, I am strongly in favor of the view that every farmer in the country should plant for his own wants.

By the Chairman:

Q. Can you cite any countries in which the destruction of the forests has had a bad effect upon agriculture?—Almost all countries in Europe have suffered more or less from the destruction of forests. Even in those countries where the remaining forests are now maintained in the best state of preservation, there are certain districts that have suffered fearfully. I may mention, in this connection, Switzerland, Germany, France, Italy and Spain. In Spain it is almost impossible, at all events, it would be the work of centuries, to restore such districts to their former productiveness. The slopes of the Southern Sierras, the fertility of which was, at one time, the admiration of Europe, have been entirely denuded; and those who have purchased the land, or the land owners, will not go to the considerable expense it would involve to reafforest them. I suppose this is attributable to the fact that, at least, now-a-days, most people do not think it worth while to embark in speculations that will only profit their grandchildren or their great grandchildren. The losses sustained every year by floods alone are something enormous; and those floods may be traced to the destruction of the woods on the head waters of the rivers.

Q. So you think the destruction of forests has a great influence on agricultural productions?—Most decidedly. This is a question that may be viewed from many points, but the best proof I can give you of the influence of the forests upon agricultural productions, would be the steps taken by all the Governments in Europe to preserve their forests, and to enlarge them. They have gone the length of depriving private owners of their rights over their own wood lands in a great many instances. They insist that timber shall not be cut down on the banks of rivers within so many miles of the river bed. They require that no woods shall be cut down on certain hills where they protect a large area of arable land from such and such winds, known to be injurious to the crops in that part of the country. Such forests are made permanent. They can be thinned, but not destroyed. In Germany for instance, wherever it is necessary to cut down any forests, the whole of the neighboring land owners must be consulted; and it is only upon obtaining their consent and upon that consent being ratified by an officer of the Government, that the land owner can cut down his own trees. One reason for this, too, is the fact that the great rivers of Europe have diminished very considerably—I have not the statistics with me—during the last fifty or sixty years. Rivers, which were once navigable for vessels drawing 3 or 4 feet of water, are now not fit to float a respectable barge. This has caused very serious alarm, and much loss, because, of course, water carriage in Europe is very important, and as here, it is much cheaper than carriage by rail, in view of which it is important that the competition which exists should not be removed. This is a consideration which has exercised a very powerful influence in the direction of securing the preservation of the forests, with both the Governments of Austria and Germany.

Q. Do you believe that the destruction of the forest would affect the climate and result in more frequent droughts?—That is inevitable. Without forests you have no surface influence to equalize the temperature. The forests of a country act as conductors; they influence the air currents that pass over them; they attract the moist currents, to what extent, in this last point, is still a matter of discussion and of very serious investigation throughout the experimental stations of Europe. Attached to all the large schools of forestry they have established meterological observatories, their instruments are placed in the middle and on the borders of the forests, and in the open lands in the neighborhood, so as to be able to form an idea of the extent of the rainfall in the different sections, and, in addition, of the moisture of the soil itself.

Q. What are the defects in our present system of forest management?—I may say that the one defect in the forest management of Canada is that there is no management at all. The Governments do not seem to exercise any control over the treatment the forests receive. They regard them simply as a matter of revenue,

and with the exception of certain restrictions that are placed upon the use of fire and the cutting of very small wood, they exercise no direct control over them. The limit holders are absolute masters of the woods they lease. They are not bound either to cut in one section or in another, and provided they do not cut trees under 12 inches in diameter, they are not required to make any provision for maintaining the supply of wood. There is no provision made for a district that has been cut over, a period of rest that young trees or the soil may have time to attain a certain maturity. Another thing I might have said when you asked me about the control of Governments in foreign countries over their forests, is this: there they cannot cut more than a certain proportion of trees, even in districts where the forests are used for commercial purposes exclusively; they are not allowed to cut down more in a given district or than a certain proportion; they are not allowed to cut down entire blocks. Supposing a limit owner, finding that the timber market is good, would wish to cut down a whole district, he is not allowed to do it. The Governments decide upon the quantity of lumber to be cut every year. The Government foresters then visit the forest, and point out certain blocks or certain trees in those blocks which may be cut down. Of course it would be difficult to introduce an exactly similar system in this country, but some kind of a system should be introduced, under which the Government can exercise control over the lumber limits.

Q. Have you anything to say about the nature of the control foreign Governments exercise over the wood lands of their respective countries?—The tendency is to exercise a more rigorous control over them and to prevent any steps being taken under which the regular proportion of forest land, which should exist in every State for the advantage of agriculture, may be diminished. The wood lands of a country should not be less than 25 per cent. of the whole arable lands. That is considered a proper proportion, and when that proportion does not exist, it is maintained that the cause of agriculture suffers.

Q. Could the Government or Governments of Canada exercise a satisfactory control over the wood lands of this country, and in what manner?—In the older Provinces the question is one which would involve a great deal of debate and discussion. The Government have, by the present mode of leasing limits, lost much of their power to interfere in the matter, but they might regain it by taking up limits which are denuded of their large timber by the limit holders. They might take these back into their own hands without inflicting any serious loss upon the lessees, and they might also place limitations upon the size of trees to be cut down. There are two points at least upon which they might exercise very efficient control. But the principal point upon which they might take action would be this: they should set apart the lands which are known to be unprofitable for agriculture and retain them exclusively for forestry purposes, or to the production of timber. We have lands of that character here. Up the Ottawa, for instance, settlers have been induced to go in and settle on the pine lands. There, after one or two crops, it will take more than the original value of the land to make them produce again. After three or four crops at the outside, the thin covering of soil over the sand becomes utterly exhausted. These pine lands, and all the lands only fitted for the cultivation of pine and spruce, should be set apart exclusively for the cultivation of those trees. There are millions and millions of acres in Ontario and Quebec which could be made productive timber districts, but which will never be productive agricultural districts and will never pay for the labor, to say nothing of anything else that may be spent upon them for agricultural purposes. If these lands were set apart as timber lands they would be advantageously utilized. The Government could either take them into their own possession or lease them for a certain number of years in blocks, providing that no more than a certain number of trees should be cut down, and that when they were cut the land should remain undisturbed for five, ten or fifteen years, when it would be likely that a fresh crop of wood could be taken out advantageously. Of course there are lands in which the lumbermen possess a vested interest. It cannot be denied that they have opened up these lands and that they have spent enormous sums of money upon roads, in damming the rivers and so forth. It would not be just

to dispossess them; indeed they have rights that cannot be overlooked. Under the circumstances, there should be granted a permanent interest on these limits, but on condition that steps should be taken to maintain in such districts a regular and perpetual supply of wood. This question involves a great deal to the agricultural population of this country. These forests, it must be mentioned, would afford employment to thousands of young men who have nothing to do on their farms, during the winter months; and I know that in many districts the money earned in the woods during the winter goes to the old homestead and helps to maintain the family and to improve the farm.

Q. What advantage would our farmers derive by devoting their attention to timber culture?—The special advantage they would derive is this: On every farm there is probably a certain portion of the land which will not pay for farming purposes, but would pay a profit if laid out in wood. As to the nature of that wood—whether it should be wood for fuel or merchantable wood, black walnut or any other hard wood of annually increasing value, should be at the owner's option. Black walnut is now bringing in England $1.25 per cubic foot, and I think in New York it is up to 75 cents or 80 cents. There is a constant demand for it; in fact, the danger is, that before long the furniture manufacturers will be driven to employ some imported woods from the West Indies or South America as a substitute for it. But irrespective of that, if the farmer cannot grow hard woods for merchantable purposes he should, at any rate, grow wood for the ordinary wants of his farm. It would be advisable for every farmer, seeing the high price of fuel and the possibility of that price—particularly for wood—increasing, to set a section of his land apart in order that he may maintain his own supply of wood for fuel. I look upon it, too, in this light: Apart from the commercial value or the profit he might make by adopting the policy I have just mentioned, the farmer would have, under it, sufficient wind-breaks for winter and sufficient shelter for his cattle in summer. It is well known that sufficient shades for cattle during the summer when out in pasture are highly necessary. I know myself that in driving through Central Indiana last summer, it was in some districts pitiful to see the poor beasts leaning against wooden fences for protection from the rays of the sun; whereas, in other districts where they have retained some of the oak groves, the cattle were lying down at their ease in the shade and in apparent comfort. I need hardly say what a benefit it is to their milk and to their flesh that cattle should graze at ease.

Q. Would you favor the introduction of foreign species of trees into this country?—Decidedly. It is well known that in course of time the soils that have previously been most productive and have yielded fruits in the most prolific manner, become exhausted and refuse to sustain what they have been in the habit of producing. This applies to crops; but it is the same with trees. There comes a time when the soil is exhausted, and will no longer yield that nutriment for the trees that it formerly did. This is a matter of every-day notoriety.. It is known that in certain districts, trees when first planted, flourished and made extraordinary progress in their growth, but when replanted with the same species the new plantations perished without any apparent cause. Some have attributed the circumstance to parasites: but in many districts it is well known that the real cause is the impoverishment of the soil. For this reason, I should favor the introduction of new species into the country to supply the old ones. Sometimes exotics will flourish and thrive better than the native tree will. It does not follow that they will continue to thrive; but we have it established by actual test in Europe that certain imported trees have, for one, two or three generations, thriven remarkably well. Besides, as you have rotation of crops, so it seems only natural to have rotation of trees.

Q. What agency or agencies would you employ to promote tree culture and to introduce new species?—The introduction of new species can only be effected by Government agency, that is, if you wish the advantages to be derived from so doing to be general. Individuals may go to the trouble and labor of introducing into the country new species which may be of service and advantage; but few can afford the time and expense that is requisite to insure success. Nor is it everyone who,

each of them, so much land shall be set apart as woodland, that so much land in every township shall be laid out in wood, or that in certain sections over which storms pass, trees shall be planted to act as wind breaks.

Q. Are you acquainted with the organization and scope of the agricultural stations in Europe? And, might similar organizations here, produce the results you have spoken of? Yes; I have seen several of these agricultural stations. I am glad to say that during the last nine or ten years they have been increasing very rapidly in every country in Europe. At a Congress held recently in France, there were representatives present from stations in Belgium, Holland, Italy, Germany and Spain. The principal objects of these stations, which are there called agricultural laboratories, are to study the nature of the soil, to analyze soils, to examine and analyze plants, fruits, and so forth, and to find out what properties various soils possess and the character of the crops those properties enable them to produce successfully. I have here a statement made at a meeting in Germany on the subject of Forestal experiment stations; and it mentions that among the problems to be solved through the agency of these stations are the following: to determine the influence of forests upon soil and climate; to investigate the relative value of the several methods of thinning; to establish reliable tables of increase, and the method of valuing forests; to study the foes of the forest, both animal and vegetable, and to devise means of successfully combatting them; to determine the value of forest better upon the growth of trees; to test the relative value of forest implements; to devise new methods of obtaining forest products, and to find new uses for the same; in short, to furnish the means by which to increase the wealth of the owners of forests, and thus that, of the entire country, and to furnish legislative bodies with the foundation necessary for a just taxation of forests and for a wise and beneficent code of forest laws. So you see that the advantages to the owner of forests, and the advantages to the States are very great. Now, in order to give you an idea of the expense of this, I may mention that the Station in Prussia received in 1882, 27,000 marks or $6,750; the Station in Bavaria, 44,000 marks or $11,000; the Station in Saxony, 14,000 marks or $3,500; and the Station in Wurtenburg, 7,000 marks or $4,750. These are like central Stations having their ramifications all over the country. So that the entire amount of money expended for the maintenance of Forestal Experiment Stations in Germany amounts to about $30,000 annually.

By Mr. Fisher:

Q. Do not the ramifications through the country involve additional charges?—Very slight additional charges; there is a margin of $9,000 or $10,000.

Q. That charge would be included in the $30,000?—Yes. Of course a Central Bureau, conducted in an energetic manner should cause experiments to be made all over the country, and it could do this with the help of agricultural societies or horticultural associations in the various localities in which they might consider it desirable to test the growth of any prrticular tree. In one district a particular plant might be studied, and in another some other plant, so that the Bureau might have all over the country men well qualified to do the work, and proud to associate themselves with it, provided the ordinary expenses of making the tests were paid. Now, in Quebec there is a Forestal Association. If a moderate sum of money were offered by the Central Station to that association, it could procure information respecting the growth of various trees, and could distribute among people who are well-known to take an interest in forest growth, a supply of plants which they might try. This is the object of the association, but it fails of its object by the want of means. A moderate supply of money would set it in motion, and it is astonishing when once a start is made in these things how the work will go on. It would be well for a Central Bureau to inspire an interest in these things throughout the country, in order to see what information can be elicited in the country regarding the objects it should be its duty to investigate. In England and in France they have two great associations, in England, the Royal Agricultural Society, and in France, the Society for the Encouragement of Agriculture. They do an enormous amount of work for the country.

would be first of all, to supply information that might be of interest to agriculturists throughout the entire Dominion, and then to collect experience from all parts of the country and put it before the whole country, so that whatever was found advantageous in one place might be tested and tried in another. All this could be done by a Central Bureau with the least possible delay; and it is necessary that it should be done with the least possible delay because the race in trade now has become so keen that nocountry can afford to lack knowledge possessed by another.

Q. Why should the Federal Government charge itself with timber culture, seeing that the woodlands of the country belong to the Provincial Governments?—It is true that these woodlands belong to the Provinces, but then it must be remembered they form the groundwork of the greatest industry Canada possesses. After the agricultural exports, come the exports of forest produce. They amount to, I think, just about eight times as much as the exports of all the other industries of Canada combined. Consequently, as the Federal Government has charge of all that pertains to trade and commerce, it ought, to my mind, devote considerable attention to the greatest industry the country possesses. Moreover, this question of maintaining the supply of the forest wealth of the country is one which involves, not only the employment of 100,000 people, but the whole external commerce of the country is affected by it. In Quebec alone, there is scarcely a year in which we have not 600 or 800 ocean-going vessels coming in to carry away lumber. It has been said that this is a fading industry, but if it were to fade away altogether, so would the 600 or 800 vessels that visit Montreal and Quebec, and so would the large number of vessels that frequent the ports of the Maritime Provinces. If we drive away such an amount of shipping from the country, we would soon lose our position as fourth on the list of Maritime nations. Then again, another reason why every effort should be strained to make this a permanent industry is, that you have no better means of barter with foreign countries than wood. The demand abroad for wood is on the increase, and it is likely to continue on the increase, because the population of Europe is augmenting rapidly, while the area under timber is stationary; consequently, there is never any falling off in the demand for lumber Such changes as affect the lumber market are changes which are brought about by the lumbermen themselves, that is, by overproduction. For instance, the demand in England has been one of steady increase; and the consumption, taking a five years' average, has been as regular as possible. But, unfortunately, the lumber merchants, when they have one prosperous year, want to make a better one the next; the consequence is that they frequently flood the foreign market with lumber, and then comes a falling off in the demand.

Q. What benefits would you expect to accrue from the establishment of a Central Bureau, and what methods could it pursue to the interests of timber culture?—One of the first duties of such a Bureau would be to find out what methods prevail in other countries, what methods are most successful, and how they can be adapted to the wants and requirements of this country. This is information which, of course, could be furnished to all the Provinces. Besides, this Government has one of the grandest opportunities imaginable, to try on its own lands in the North-West, experiments in tree culture. There, you have a country which, whatever its other advantages may be, whatever its agricultural wealth may be, certainly lacks one great element supposed to be necessary in every other country, if the agricultural classes are to prosper —and that is wood; it is—or at least an enormous section of it is—a treeless waste. How can that country be supplied with timber sufficient to influence its very fickle climate, with its storms and blizzards? How can sufficient shelter be afforded the cattle on the large plains near the foot of the Rocky Mountains? How can sufficient fuel be supplied? The fuel question, as there is coal there, is not likely to be very serious, but the quantity of wood the settlers will require must be very large, and I know its price at the present time forms an enormous tax upon the settler going into the country. So that the Federal Government, by collecting information useful to the older Provinces, and by experimenting itself in the North-West, would have the opportunity of doing a vast amount of good. Nothing would be easier than at the present time to decide, before the organization of the new Provinces finally, that in

each of them, so much land shall be set apart as woodland, that so much land in every township shall be laid out in wood, or that in certain sections over which storms pass, trees shall be planted to act as wind breaks.

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In England, of course, it is done entirely at their own expense, and for their own benefit, because there, most of the land is let out by the landlords to the farmers, and what is to the welfare of the farmer is to the welfare of the landlord, who has a pecuniary interest in securing the improvement of agricultural methods.

By the Chairman :

Q. Have you visited any Botanic Gardens in foreign countries ?—Yes, I have. These gardens are to be found in every part of Europe. But the Botanic Gardens are not used to the same extent there, as the Agricultural Stations. Their object is not so practical as that of the agricultural stations. Still, in all the large cities on the continent they have these Botanic Gardens, and they are regarded as necessary.

By Mr. Fisher :

Q. They are, I think, more a matter of pleasure and of art ; their attention is more directed towards exotics and experiments in ornamental growths ?—Yes ; but the Kew Gardens near London, and the Jardin des Plantes in Paris, have both done a great deal of good. They have had seeds from all parts of the world with a view to determining whether or not they can be acclimatized. But outside of that, their experience is worth very little. However, having direct relations with the chief officials of other countries interested in Botany, and having charge of Botanic Stations, they can obtain readily seeds from those countries. Sir J. Hooker, of Kew, receives specimens from all parts of the world, and he returns to them what he considers might be advantageously introduced into those different localities. I have no doubt, for instance, that an application to Kew Gardens would bring seeds to this country of any particular species. We could thus obtain species from Siberia, or from climates similar to our own.

By the Chairman :

Q. Do you think Experiment Stations might be established in this country with success ?—I do not see why they should not be as successful here, as they are elsewhere.

Q. What result would you expect from them ?—I would expect an all round improvement in the value of the agricultural products of the country, and the introduction of many species of roots, plants, &c., that are not cultivated at present. I would also expect a very great improvement from having connected with the Central Bureau, a Department of statistics, which would show the movement of grains in the different countries in the world, and their prices. The United States have devoted a great deal of attention to this matter; and have shown their merchants and large dealers the condition of the grain from month to month, and the markets to which it would be to their interest to forward it. Of course, if a country like France, for instanee, has a full average harvest one year, it would not do for American merchants to consign their grain to Havre or Bordeaux. And the same may be said of other countries.

Q. What should be the work of such a station with respect to forest culture ?—The misfortune appertaining to forestry in this country, is that there is no reliable experience to guide you. Except in a very few cases, which are private; there has been no attempt made to introduce foreign trees except here and there, as a matter of ornamentation, and those trees have been so specially trained and cared for that they form no criterion to guide the experimentalist. If in every Province of the Dominion they were to plant trees and to keep a record of the soil in which they are planted, and their annual growth, it would be a matter of immense value to the country. We would not then be told as we were at a meeting in Montreal a couple of years ago, by some men who have been brought up among spruce and pine trees, that pine would not become a merchantable article under a hundred and twenty years, and by others, that it would be merchantable in less than thirty years; nor would we be told, that spruce is of a slower growth than pine, and so forth. These statements only show upon what unsound foundations people here possess upon which to form their opinions. I have no doubt that every one spoke as he believed he was justified in speaking; but if you had Forestal Stations, the results of the labours of which would be to give the proper mode of culture of the proper tree

adapted to such and such a soil, and pointing out what profits you or your children might derive from planting such and such species, it would afford a great impetus to the cultivation of timber throughout the entire country.

Q. What should be the extent of a station for forest culture?—The work could be carried on, on a very small piece of land. With ten or twenty acres you could try almost every species. However, you would have to select a spot where there would be some varieties of soil.

By Mr. Fisher:

Q. Would not such an Experiment Station carry on its experiments more satisfactorily by getting people in the different parts of the country to assist?—It would be the real function of the Central Bureau to do that; it would not do all the work itself, but would cause it to be done throughout the Dominion.

Q. There are people of trustworthy experience who would take a sufficient interest in the work to assist such a Central Bureau as that, and at a mere reimbursement of absolute outlay, they would be very glad to make experiments and to report to the head of the Bureau the result of the experiments they make?—There are thousands of people who would be only too glad and too proud to undertake the work.

Q. People who now are making these efforts in a very undirected and disjointed manner?—Most decidedly. Such people have no guidance now, and what slight experience they may acquire is of no advantage to others; whereas if the different experiments and conditions were examined here by some central authority, and disseminated throughout the country it would be to the general advantage, and much good would be done.

Q. I suppose the fact that we are only now ceasing to make war on our forests has prevented the spread of any great interest in forestry and tree culture; in the past we have had to cut down trees to such an extent and so vigorously that it is very hard to get people to understand that the time is past for that kind of work, and that we should really commence to replant?—Of course that has been the root of the evil in this country. The tree has been looked upon as an enemy, and people have from their earliest days been taught to think that if they destroy the tree they are doing a good thing, and are removing so much encumbrance from the ground.

Q. The peopole who understand forestry have come to the conclusion that that period has gone by?—Yes. In all the well settled sections, and even in the wooded sections there have been enormous losses through injudicious cutting. Had the people acted with any judgment and knowledge they might have kept up a comparatively good supply. Instead of that, they have cut down where there was no necessity for cutting. Besides, instead of cutting only the large trees they have cut away an immense number of small ones. These were used for rafting purposes. Had they been left they would have been of value to the country, and the removal of the big timber would have been of advantage to them, because it would have allowed the light and air to reach them. But, of course, the lumbermen were not concerned in these considerations.

The Committee adjourned.

OTTAWA, 20th March, 1884.

The Committee met, Mr. GIGAULT in the Chair. Maj.-Gen. LAURIE, Halifax, called and examined.

By the Chairman:

Q. Would you be kind enough to tell the Committee what experience you have had in agriculture?—I should perhaps first explain how I came to appear before you. I am President of the Central Board of Agriculture for Nova Scotia, and, almost by accident, I received a copy of the questions your Committee has been circulating through the country. I submitted them at once to the Board of Agriculture, but as they had not received a copy of the questions formally, they hesitated to take up the subject. I asked them to prepare answers, as we were desirous of assisting you in every possible way in the enquiries you were making. However, they demurred at

first to consider the questions, because they had not come before the notice of the Board officially, and they did not know in what way any uninvited responses to the questions might be considered by your Committee, and I then submitted the questions to the Provincial Government. We have no Department of Agriculture in Nova Scotia; the Board of Agriculture is the body really charged with carrying out the work of the Government in this branch of the public service. The Government, through the Provincial Secretary, requested me to submit the questions formally to the Board of Agriculture, and the Board of Agriculture, after considering them, requested me to put myself in communication with you, and if possible, to appear before you and give you such information as I possess in regard to these matters. We were desirous of showing how anxious we were to support your action in the direction of advancing agriculture in the way you propose. Personally, I have been engaged in farming in Nova Scotia since 1866. Of course I have not taken up farming as a means of livelihood, but I have had a good deal of experience in agriculture, and have been President of the Board of Agriculture for some eight or nine years. In that way I have learned a great deal about agriculture. I cannot call myself an expert on matters relating to experimental stations, nor have I gone deeply into scientific farming, but at the same time I have striven, as far as in me lay, to improve the system of farming in our Province.

Q. Under what difficulties does the present system of agriculture labor, and in what respect is the Canadian farmer placed at a disadvantage when competing in foreign markets?—I speak, of course, of the Nova Scotia farmers, because I am best acquainted with them. I have mixed with the farmers of that Province during my command of the militia, for the last twenty-two years. The Nova Scotia farmer labors under these disadvantages, to my mind: he has received no agricultural education—by which I mean, training in the sciences connected with agriculture, and concurrently in the application, in practice, of the knowledge so acquired. He consequently is quite unaware what his land is capable of, or how to obtain the greatest return for his labor and other outlay. Our fruit growers have given great attention to that industry, and with exceedingly good results; but with this exception, and that of a few intelligent men who, under favorable conditions, are reclaiming marsh lands, and carrying on their work profitably. The vast majority simply obtain a subsistence, and the results, consequently, are so discouraging that even when in any way money is acquired it is invested in anything rather than farm property. There is no encouragement to invest capital in farm operations, because there appears no promise of a return; consequently, improvements are not actively carried out. Hired labor is only employed at busy seasons, and being irregularly employed, the supply is irregular and uncertain; and wages are high. This reacts, and men of means are discouraged from engaging in agriculture. Our young men receive good advantages in education, but not in subjects which are directly of value to agriculture, and they go into overstocked professions, and leave the country. We require first, to fit them to remain at home and follow agriculture, for I conceive the native-born is the best inhabitant a country can have. Next, we want immigration of men of moderate capital. Farm property is exceptionally low and plentiful in the market, but unfortunately the capabilities of our Province are not well known in Europe, and hence intending immigrants do not come to us. We want men of some capital, as machinery is now a necessity, and manual labor cannot compete with it. Hence, those who attempt cultivation without machinery become discouraged and leave the country.

Q. What deficiencies have come under your notice in the cultivation of cereals; cultivation of roots and grasses, raising of stock and wool growing; production of butter and cheese; culture of fruit and the ordinary use of fertilizers?—I do not quite understand whether you wish me to say what results have attended the cultivation of those crops in our Province?

Q. What defects have come under your notice; how is the system of agriculture defective in the cultivation of cereals?—I think I have covered that question pretty well in my first answer. I could, of course, tell you what we are doing in the

cultivation of the various crops, but I do not think that would be an actual answer to your question.

Q. Would the importation of seed from foreign countries benefit our farmers?—We are doing all we can to improve our seeds by this plan, but it has to be done by private parties, and it is a matter of difficulty and expense to our farmers.

By Mr. Bain:

Q. Have you seedsmen who go largely into that line?—No; they do very little importing themselves. We deal with Ontario seedsmen, and we find it more convenient to get our supply in this way, because we have the advantage of dealing with importers who operate on a larger scale.

Q. I suppose the field with you is not very large for the seed business?—No not large. It is supplied very largely with foreign seeds through Ontario seedsmen.

Q. What is your experience with Ontario seeds? How does the change of climate and soil operate?—Very satisfactorily.

By Mr. Massue:

Q. Do you grow fall wheat?—I am experimenting with fall wheat. It has been tried, and has been pronounced a failure, on account of our changeable winters. For instance, this winter we had no snow, but constant frosts and changes until about the 1st of March. The ground has not been covered with snow at all. I have 25 acres of fall grain, 2 acres of wheat, and 23 acres of rye, and I am afraid I shall lose it all. I had some Ontario wheat—spring wheat—last year, and it was a very fine crop. It yielded 25 bushels to the acre.

By Mr. Bain:

Q. I suppose your changeable winters caused all the trouble in fall wheat growing?—It kills it sometimes. We would have very fine crops but for that.

By the Chairman:

Q. Would a general system of inspection and branding be likely to enhance the value of our butter and cheese in the home and foreign markets?—Of the sales of butter and cheese, I have really no personel experience, but undoubtedly buyers would feel greater security in purchasing an inspected article, and in this way sales would be more satisfactory. Makers, also, would have a standard established which would stimulate them to aim at manufacturing an article of first quality.

By Mr. Bain;

Q. Has the factory system grown up with you?—Cheese factories have, but not butter. I do not think there is a butter factory in the Province.

Q. Are there no creameries?—There are no creameries, but the people of Colchester have gone into a large milk-condensing business, which has absorded the milk of the district to such an extent that it has rather paralyzed one or two cheese factories. They expect to handle this year about eight tons of milk per day.

Q. I suppose the trouble is that you can give the farmers a higher price for their milk for the condensing process?—There is not much difference in the price paid for the milk, but the same men who were formerly engaged in the cheese business have turned their attention to this work of milk condensing. We propose to turn into cheese all the milk above what we can profitably condense. I think it is pretty well established that condensed milk offers us a better market. Cheese is uncertain; if you have to keep it on hand for any considerable length of time it deteriorates. We had to hold it over, one year, and that discouraged us so much that we have turned our attention to condensed milk, for which we think we can get a steady, continuous market, and also an article of merchandise that we can hold, if we find it desirable so to do.

By the Chairman:

Q. Would the importation of fruit tree scions and plants from Russia and other countries under climatic conditions similar to those of Canada, be of service to our fruit growers?—Our fruit growers are now experimenting with such important species, and they expect good results from it.

By Mr Bain:

Q. Do you know what points they have been imported from?—I do not; I am not much of a fruit grower myself, but I have put this question to several fruit growers

and their answer is too short. They only say that they are engaged in the work of importing and experimenting, but they do not say from what point they bring the new specimens.

By the Chairman:

Q. Would the appointment of a public analyst, to whom samples of soil and of home manufactured and imported fertilizers might be submitted, prove of advantage to our farmers?—Yes; if he was within reach, so that the samples might be sent him, and information be promptly furnished in regard to them.

Q. What do you think of establishing an experimental farm or garden where varieties of foreign grain, fruits, trees and fertilizers might be tested, and whence such seeds, plants, &c., might be distributed throughout the Dominion, would it be advisable?—The climatic conditions are so dissimilar that experiments made in the drier atmosphere and steady winter of Ontario, would be of comparatively small value to the Lower Provinces; but experiments conducted, where the conditions of season, temperature and rainfall are similar to those encountered by our farmers, would be of very great value. Our farmers are now more or less engaged in experiments, but the labor in largely thrown away, as they have not the scientific knowledge to work out these satisfactorily, and they often arrive at wrong conclusions. But if an experimental farm was established in their neighborhood they could readily join in conducting these experiments, receiving instructions from the Superintendent of the station, as to the necessary conditions and points to which they should give attention, and these simultaneous experiments would be of more value than if conducted singly. It is very desirable that branch stations should be established. Our Dominion is very large, and the climatic conditions are very dissimilar, so that a central station, without the branches, would not bring all the benefits we desire. It would, without doubt, confer great advantages, but it should be supplemented by branch stations.

Q. Have you noticed any appreciable deficiency in the crops of your district owing to the depredations of birds and insects?—Our wheat suffers from what we call the weevil, and this year the crop failed in many places. In fact, it may be said to have succeeded only where it was sown in a position where the crop would be exposed to the wind.

By Mr. Bain:

Q. Do you try early and late sowing, to see if you cannot fight the insects in that way?—We have tried all kinds of remedies, but so far as the time for sowing is concerned, our seasons are so short that we cannot afford to wait. I sow as early as I can; I sowed in April, last season. I am situated between two lakes, and the wind has a pretty good sweep over my land. We had abandoned wheat growing for about twenty years, but it has been resumed again in some places, and I have gone on increasing the area, till last year I had twenty-five acres.

By the Chairman:

Q. What crops and fruit products have suffered most, and from what classes of insects or birds?—Our wheat, as I have said, has suffered seriously from the weevil.

Q. Have your fruit trees suffered also?—They have suffered from insects—the borer and others—but as I am not prepared to give a clear answer on that point. I simply know from hearsay.

Q. What steps are taken to keep down insects?—For years the cultivation of wheat was abandoned, with the hope of destroying the germs of the weevil. Now they are beginning to grow wheat again, and the crop is becoming better.

Q. Have the timber trees of your district suffered any from insects?—Shade trees have suffered from caterpillars, but the timber trees in the forest have not suffered at all. The shade trees in the neighborhood are entirely stripped.

By Mr. Bain:

Q. What varieties of trees do they attack mostly?—They do not seem to be at all particular. They attack any kind of tree they can find, in the shape of shade trees, in the neighborhood of Halifax. I am told, also, that they attack forest trees, in some districts.

Q. Would you recommend the appointment of an entomologist, whose duty it would be to give information concerning birds and insects, injurious or beneficial, and the means of protecting the crops against their ravages, accomplish any benefit to the farming classes?—Undoubtedly he would, if he was located in the neighbourhood, within reach, but an entomologist 1,200 miles away, unless he was either able to come to the insects or the insects to him, would not be of very great value. An entomologist, however, in connection with what you spoke of earlier—experimental stations—would, I think be valuable.

By Mr. Landry (Montmagny):

Q. Do you not think an entomologist here at Ottawa would be able to render important service, by having cases reported to him here?—Not unless he was a witness of the damage done.

Q. But when he is acquainted with the nature and habits of the insect pests, do you not think he could give very important advice and information on the subject, even though he is far away?—I think he would be of far greater value if he was in the neighbourhood. I think it is highly desirable to have him where he can see the workings of the insects and take measures to eradicate them and be responsible for their suppression or extinction.

By Mr. Macdougald;

Q. You think the field is too large for one entomologist to do good service?—I think it would be beyond his capacity. Of course he would be of some value.

By Mr. Landry (Montmagny):

Q. Do you not think that if it was possible, only to employ one entomologist, and have him placed in charge of a central station, he could give information to all, through the whole country?—I think it would be far better than to have none at all.

By the Chairman:

Q. Have you read a book written by Mr. Saunders, of London, Ont., on insects injurious to fruit trees and crops?—I have not.

By Mr. Bain:

Q. I suppose an entomologist, situated locally, would be of use most where a local pest, peculiar to the district, should break out, because he could then go and examine the circumstances and all the conditions, and he would be able better to point out a remedy?—Yes; and if the central entomologist is able to visit the locality he would be just as useful.

Q. But take, for instance, the case of the tent caterpillar, which is found in all parts of the country and is pretty well known. In the event of a visitation from this insect to any distant part of the Dominion, the entomologist at the central station could be put in possession of all the facts by correspondence. But if it was a case in which a new insect appeared, it would be his duty to visit the locality and observe the operations of of the insect and all the conditions?—Yes; I suppose so.

By the Chairman:

Q. Would it be desirable to extend the duties of the present system of veterinary inspection of stock in quarantine, and, if needful, the staff also, with a view of dealing with the local development of infectious diseases among farm stock and poultry throughout the Dominion, and the best means of stamping them out?—Do you mean by this to ask whether or not it would be desirable to extend the quarantine stations also?

Q. I mean, to have a veterinary surgeon employed by the Bureau here, who could visit any place and investigate diseases and give the necessary remedies for stamping them out.—You do not refer only to the importation of stock?

Q. Not only to imported stock, but to Canadian stock also.—With reference to the question of quarantine, we have no quarantine station for animals imported from the States nearer than Sarnia. Consequently, if we wish to import an animal from Boston, we have to bring it all the way around by the Grand Trunk Railway.

By Mr. Bain:

Q. Where is your nearest quarantine station?—At Quebec. We have none in the Maritime Provinces at all. If we wish to import an animal from Liverpool, we

must bring it around by Quebec; if from Boston, we have to go around by Sarnia. This is extremely inconvenient; in fact, it practically prohibits importation to our Provinces. We earnestly desire that quarantine stations should be established at Halifax, and at Yarmouth also, and that the staff should be held available to visit localities where there is any doubt as to the existence of infectious diseases, and take the necessary steps to prevent its ravages. It is desirable that the veterinary staff should be composed of men of recognized ability, and that they should be made available also to enable us to import cattle direct.

By the Chairman:

Q. Is there in your neighbourhood sufficient standing timber to supply shade, fuel and other domestic wants?—So far there is no deficiency. We still export lumber largely.

Q. Have any steps been taken to maintain this supply, or to replant where it has failed?—No steps have been taken in the direction of replanting, but efforts are made to prevent the destruction of forests by carelessly setting them on fire. We have suffered very much from the burning of our forests.

Q. What do you think of the establishment of a Central Bureau here, in Ottawa? I think it would be of great value, but I would urge strongly, as I have done already, that it should be carried on in connection with local branches, so that the proposals in reference to the employment of a public analyst, entomologist and veterinary inspector, and the establishment of an experimental farm or garden, could be the better considered and carried out. I think the Central Bureau would be of very great value, but it should have branches to do the work you desire to aim at.

Q. Do you not think that the branches should be established by the Local Governments?—The great difficulty is the lack of funds on the part of the local authorities to carry out such a work. I have been pressing upon our Provincial Government to do something in this direction, but they find a difficulty in the question of means.

Q. Would the dissemination of handbooks and reports containing the data thus collected, on culture, stock-raising, dairying, poultry keeping, &c., have a beneficial effect?—I should say, yes; most decidedly; provided the information afforded, had consideration to local circumstances, and did not attempt to prescribe what was desirable for all localities from experience obtained in any one only.

By the Chairman:

Have you studied the working of the Central Bureau at Washington?—I have not.

Q. Would you recommend the formation of a section devoted to agricultural statistics?—I think it would be of very great advantage, in keeping our farmers informed when to sell and when to hold; would check them from over-producing particular crops and stock, and glutting the market; and would keep prices steady, and hinder fluctutation and speculation. It would enable them to know how best to dispose of their produce. As an illustration, the farmer would always be in a position to feed his grain crops when prices are abnormally low, and the statistical returns would inform him if the fall was temporary or from local causes, and whether or not it was likely to remain steady throughout the year.

Q. Would the issue of monthly bulletins and abstracts, containing such information, be of sufficient advantage to warrant their publication?—I think it would complete the services rendered by a statistical bureau.

Have you any further suggestions to offer?—No; I think the questions that have been asked have covered the ground pretty completely.

By Mr. Landry (Montmagny):

Is there any agricultural industry in your Province in operation?—We have a cheese factory, and a large condensed milk factory.

Is there not a starch factory?—No; I do not think there is a starch factory in the Province in operation. We have some meat canning establishments which are in operation in Cape Breton, and I know they are canning fruit in the Annapolis valley, and also corn and tomatoes, but it has only lately commenced, and it has not attained to very large dimensions as yet.

Have you any beet sugar factories?—No; we manufacture our sugar by catching fish: that is, we catch fish and send them to the West Indies, and bring back sugar in return.

By the Chairman:

Q. Have you only one condensed milk factory?—Only one and it was started last year.

By Mr. Massue:

Q. Does it pay?—Yes; it is paying 8 or 10 per cent., which is pretty good for an experiment.

Q. Do you think it is better than cheese making?—The condensed milk factory was started by a company, the shareholders of which, are largely those who compose the company who are engaged in cheese making. They have suspended operations to go into the condensed milk business, so that it must pay better.

By Mr. McDougald:

Q. I suppose there is less competition in the condensing business?—I think, from enquiries that I have made, that the principal inducement was that there was a more certain market.

By Mr. Massue:

Q. Where do they find a market?—At Winnipeg; and with the trade generally.

Q. Have you any agricultural schools in your Province?—We have not, but we very much desire to have one.

Q. You believe it would help agriculture very much?—I think your proposition for an Experimental Station should be associated with an Agricultural College. The Experimental Station, the model farm, and the institution for imparting agricultural education seem to be bound up together, and are very necessary in our Province.

Q. Don't you think those colleges should be founded by the Provincial Government?—I am afraid that if they are not established by the Federal Government they will be delayed, in some cases, for a considerable length of time. I think the Ontario Agricultural College is an institution of great value, and a great number of young men from Nova Scotia are attending it. I consider that institution, and the farm in connection with it, are a fair sample of what the other Provinces should do in this direction. The prospectus and the theory of the institution could hardly be improved; the practical carrying out of the principles taught there, depends upon the young men who go for instruction. Circencester College, in England, is largely attended by the sons of gentlemen, who bring their horses with them and go out hunting occasionally. At that institution young men are trained more to become managers of estates and gentlemen farmers than anything else. There, the inducements held out to become farmers have been such that I have known men of my own profession sell out their positions in the army and engage in farming for pleasure, but in a year or two, when the price of their commission was gone, and they found that they were loosing money, they would denounce farming pretty strongly, and say that it did not pay. They were not practical farmers.

Q. I think one objection to experimental farming being engaged in by ordinary farmers is that it is expensive?—Yes; and they have not time, amidst the hurry of seeding and harvesting operations, to attend to experimental work properly. In reference to agricultural colleges, we have, unfortunately, five degree-conferring colleges in Nova Scotia. One of those colleges has attached to its curriculum faculties for obtaining instruction in law and medicine, and we have been urging that some other college should take up agriculture, but we are met by the statement, from all who have examined the subject, that agricultural faculties attached to arts colleges have invariably been failures.

By Mr. Bain:

Q. I presume there would be no money in them at all; that is, the revenue to arts institutions is generally provided from outside sources?—I think so; but still we suggested that the agricultural part of the college should receive assistance from the Government, but it should be associated with existing colleges, so as to take advantage of their machinery, in the shape of lectures, buildings and staff. From all

sides, however, we have been advised not to proceed with this scheme. I believe there is no reason why an agricultural faculty could not be attached to one of our colleges, at an expenditure of $3,000 or $4,000 per annum. This would supply one professor of agriculture, a veterinary professor, and a farm manager. I believe that, of all things, it is necessary that theory and practice should go hand in hand in this work.

By Mr. Bain:

Q. I know, on the American side, they have separate agricultural colleges with special endowments, but some of them seem to be failures; there seems to be something in the details of management which affects them; so much depends upon the practical manner in which they are managed, unless it is practical the college is unsuccessful, and it seems to be difficult to combine practical agriculture with successful management?—I am sure there are difficulties to be met with; but there is a greater difficulty than that you have mentioned; it is the difficulty of obtaining special endowments for special colleges. In view of that, the question arises whether the plan of teaching agriculture is not the better one.

Q. Especially when you have a farm that might be worked?—Yes. The fear is, of course, that the professors would have to perform extra work, but that is a matter of detail. Agricultural education is now become of first importance.

Q. In the older Provinces we have arrived at the time when machinery has to do the work formerly done by hand, and to make his business successful, a man has to look before him?—Yes. An experiment station, valuable as it would be, would not, to my mind, satisfy the wants unless it was associated with practical training, so that you could teach the individual farmer how to utilize the information you would give him. It seems to me that giving the results of experiments without showing the farmer how to utilize them would be like telling a man merely the names of drugs and putting him into a drug shop to prescribe from any bottle he might choose to select.

By the Chairman:

Q. Journals of agriculture published in France, Germany and England seem to be under the impression that experiment stations are practically agricultural colleges?—They should be necessarily allied, one with the other.

Q. They seem to be under the impression that these stations are educational, because they speak of the good results to science combined with practice there?—A man who conducts an experiment station should be competent to impart instruction to others. You utilize his services to a larger extent by combining the two.

Q. They ought to have practical experience before you put them in charge?—Yes; and they might as well communicate their knowledge to others.

By Mr. Bain:

Q. Then the conditions in France and Germany are different to ours. Their country is an old one, and has been settled for generations; ours is comparatively new?—Still the increase in the demands upon agriculture are so great that unless we obtain the utmost from our land we are working at a disadvantage. The yield will not pay for the labor now-a-days unless we obtain full crops.

Q. Then there is another thing; we must be content to change our system, in view of the development of the newer portions of the country; take for instance, wheat gowing; we might grow enough for our local wants, but it is a question whether it would not be as well to allow the North-West to grow wheat for exportation and for the Eastern Provinces, which have such good shipping facilities to raise stock; I fancy, in the older Provinces, we will have to go more into specialties as time progresses?—Yes. Did you notice Mr. Gladstone's latest advice to the farmers in Cheshire. He told them that in view of the competition in wheat and stock-raising coming from Canada and the United States, those lines of agriculture would soon be things of the past with them, and the best thing for them to do is to go into the making of jam.

Q. I notice that, around Hamilton, the farmers are doing less every year of general farming and are going into specialties. Take pumpkins; they used years

ago to grow a few to feed to the cows, but now they grow them in quantities for the canning factories. Even four or five miles from the city, the farmers are leaving everything else to grow them. In fact, they are rapidly moving in the direction pointed out by Mr. Gladstone, as that which the farmers of Cheshire should take?—Yes. The best farming districts are now being devoted to fruit; and our farm product would fall off materially if special lines of products were not adopted.

Q. Farmers must adapt themselves to circumstances, or as the saying is, they will be left?—Yes.

The Committee adjourned.

REPORT

OF THE

SELECT COMMITTEE APPOINTED by the HOUSE OF COMMONS

TO OBTAIN INFORMATION

AS TO

GEOLOGICAL SURVEYS,

&c., &c.

Printed by Order of Parliament.

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1884.

HOUSE OF COMMONS, Monday, 25th February, 1884.

Resolved,—That a Select Committee, composed of:—

Mr. Baker (Victoria),	Mr. Cameron (Inverness),
" Dawson,	" Ferguson (Welland),
" Hall,	" Holton,
" Laurier,	" Lesage,
" Lister,	" Mulock, and
" Wood (Westmoreland),	

Be appointed, to obtain information as to the methods adopted by the Geological Surveys of this and other countries in the prosecution of their work, with a view of ascertaining if additional technical and statistical records of mining and metallurgical development in the Dominion should not be procured and preserved; with power to send for persons, papers and records.

Attest:

JOHN GEO. BOURINOT,
Clerk of the Commons.

FRIDAY, 29th February, 1884.

Ordered,—That leave be granted to the said Committee to employ a shorthand writer to take down such evidence as may be considered necessary for the purposes of their inquiry.

Attest:

JOHN GEO BOURINOT,
Clerk of the Commons.

REPORT.

The select Committee appointed by Resolution of the House of Commons, on the 25th February last, "to obtain information as to the methods adopted by the Geological Surveys in this and other countries in the prosecution of their work, with a view of ascertaining if additional technical and statistical records of mining and metallurgical development in the Dominion should not be procured and preserved," beg leave to report.

The enquiry suggested by this Resolution has received the careful attention of the Committee. Its prosecution involved the necessity of procuring the evidence of members of the present staff of the Geological Survey as to its organization and internal administration; of persons not connected with the Survey, but whose scientific opinions or relations with mining operations gave practical weight to their views upon the subject of the enquiry, and of the chief officers of the Surveys in other countries, as to the methods adopted in the prosecution of their work. All the evidence adduced before the Committee accompanies this Report.

From this evidence, and the careful consideration of the history and present position of the Canadian Geological Survey, your Committee deduce the following facts and conclusions.

In the first Parliament held in 1841, after the union of Upper and Lower Canada, attention was called to the importance of a Geological Survey of the Province, and a grant of £1,500 sterling was made for that purpose. In the succeeding years, Mr., afterwards Sir W. E. Logan, was appointed to the principal position on this Survey, and Mr. A. Murray, as his assistant. The actual work commenced on 1st May, 1843. It was not until 1845 that an Act was passed (cap 16 of 8 Vic.) determining the functions of this Survey, which were as follows:—

"To make an accurate and complete Geological Survey of the Province, and furnish a full and scientific description of its rocks, soils, and minerals, which shall be accompanied with proper maps, diagrams, and drawings, together with a collection of specimens to illustrate the same."

This Act was, by its terms, only to be continued for five years, and the expenditure under its authority was limited to £2,000 sterling per annum. Dr. T. Sterry Hunt was attached to the Survey as Chemist, and with this small staff and moderate expenditure the work commenced and was prosecuted with increasing zeal from year to year. The reports which were presented to Parliament show how usefully and exhaustively the work of the Survey was conducted. Every known location was visited, the general geological features investigated, a careful chemical analysis of the minerals completed, and its results, and information as to the probable extent and direction of the deposits furnished, not only to the parties interested, but to the general public, whose attention was thereby directed to the existence, quality and probable extent of our mineral resources. In addition to this work, the Chemist of the Survey devoted his attention to the examination of the character and constituent elements of the soils of different parts of the Province, in relation to their agricultural value, and suggestions as to the best plan of cultivating and enriching them, together with other important contributions to the science of agricultural chemistry, appear regularly in the Reports. In addition to this attention to the useful mineral and other economic resources of the country—which evidently was considered the leading and most important function of the Survey—its general geological structure was investigated with such results, that this small but zealous staff, by their interesting research and brilliant discoveries, drew towards Canada the attention of the whole scientific world. Such progress had been made that in 1851, only eight years after the establishment of the Survey, the collection of mineral specimens shown by

Canada at the World's Exhibition in London of that year, drew from a distinguished member of the Mineralogical Institute of France, the following tribute in his official report to his Government:—

"De toutes les colonies anglaises, le Canada est celle dont l'exposition est la plus intéressante et la plus complète; on peut même dire qu'elle est supérieure à l'exposition minérale de toutes les contrées qui ont envoyé des produits à Londres; cette superiorité vient de ce qu'elle a été faite d'une manière systématique; il en résulte que son examen fournit des moyens d'apprécier, à la fois, la constitution géologique et les ressources minérales du Canada."

It is quite evident that the practical success of the Survey at home, and its scientific reputation abroad during those early years of its existence, were due to the remarkable zeal and practical common sense of Sir William Logan, and the enthusiasm and *esprit de corps* which he succeeded in imparting to his colleagues, and it it is no reflection upon his successor, as was frequently pointed out in the evidence taken before us, that he does not attain Sir William's success in this respect. Sir William Logan had probably no equal in those peculiar qualities which gave distinctive character to the Survey under his charge.

The scope of the Survey as established by the Act under which it is at present governed (40 Vic. Cap. 9), is certainly ample and unobjectionable. Its object is declared to be:—

"To elucidate the geology and mineralogy of the Dominion, and to make a full and scientific examination of the various strata, soils, ores, coals, oils and mineral waters, and of the recent *fauna* and *flora*, so as to afford to the mining, metallurgical and other interests of the country, correct and full information as to its character and resources."

The instructions to the Director are of an equally general nature:—

"To collect, classify and arrrange such specimens as may be necessary to secure a complete and exact knowledge of the mineralogical resources of the several Provinces and Territories of Canada, and to make such other researches as will tend to secure the carrying into effect the object and purpose of this Act.

"To report from time to time, in such manner and form as the Minister may direct, the proceedings under the Act, and to furnish proper maps, diagrams, &c., to illustrate the same."

With instructions of so general and vague a character as these, the system and organization of the Survey must necessarily depend upon the judgment, tact and skill of the Director, and the only mode of testing the efficiency of the Survey, available to your Committee, is by an examination of its practical result. Applying this test, your Committee have no hesitation in reporting that the administration of the Department under its present management, is unsatisfactory.

This results, as your Committee believe, principally from the following causes —lack of system in conducting the work, the defective method of publication, the delay in communicating the results to the public, a lack of accord between the Director and his staff, and inattention to the economic mineral resources of the country; and they refer, in illustration of this conclusion, to the following facts, drawn either from the published Reports of the Survey, or from the evidence adduced before them.

The practical result of the work of the Survey is shown by the published Reports, and these, with the Museum, are the only channels through which the public derive any good from it. The advantage derivable from the Museum is necessarily limited to a comparatively small number, and the public, therefore, look naturally to the Report as the principal evidence and record of the work of the Survey, and after a careful examination of the contents of these volumes and a comparison of them with the time when the work was done which they record, your Committee are obliged to report that they are extremely dilatory in publication, meagre in amount, and unsatisfactory in practical usefulness. The small volume just published (Report for 1880–81–82) professes to give the useful work of the Survey for two years. It contains a reprint of Dr. Dawson's report of his explorations in 1881, of the Bow and Belly

River region, North-West Territories (23 pages); Dr. Bell's report of his explorations of the Basin of Moose River and Lake of the Woods, in 1881 (15 pages), with Prof. Macoun's list of the plants collected by him in the same expedition; Mr. Ells' report of his explorations in New Brunswick, in 1881 (24 pages); and in Gaspé, in 1882 (32 pages); Mr. Willmott's report on the mines in the Province of Quebec, in 1882 (14 pages); Mr. Hoffman's report of the Laboratory work, in 1882 (15 pages); Dr. Selwyn's account of the progress of the Survey, for 1881 and 1882 (28 pages); his paper on changes suggested by him in the nomenclature and colouring of geological maps, without date (4 pages); his notes on the geology of south-eastern Quebec, without date (7 pages), with Mr. Frank Adams' appendix thereto, containing 15 pages of notes on the microscopic structure of some of the rocks of the Quebec group.

This volume, of 211 pages in all, is accompanied by six maps, illustrating work done in 1875, 1877, and 1881.

Your Committee recognize the valuable nature of much of this information, but for that reason, especially, they are of opinion that its publication should not be delayed over a term of two or three years for the reports, and from three to nine years for the maps illustrating the work.

Judged even as to quantity, it is a meagre result of two years time, for a staff of about thirty highly educated geologists, chemists, paleontologists and botanists, maintained at a cost to the public, during those two years, of over $110,000.

Your Committee are obliged, too, to report that, in their opinion, the result of this expenditure is not at all commensurate to its cost. While many of the explorations were exceedingly important, and the reports of them interesting and useful, their cost was moderate as compared with the appropriation. That of Dr. Dawson, in the North-West Territories, is roported to have been accomplished at a cost of $3,560; Dr. Bell's, in the Hudson Bay District, at a reported cost of $2,734; Mr. Ells' trip, in 1881, cost $1,068, and in 1882, $1,376. The removal of Museum from Montreal to Ottawa cost $10,000; the purchase of Indian curiosities amounted to $1,232, an addition to the Natural History collection, $2,719, and the purchase of books and instruments from Sir William Logan's estate, $4,500, making a total of $27,189, leaving a balance of $82,811 for the two years, applicable only, so far as your Committee can discover, to salaries, stationery, printing and engraving, and similar incidental expenses, for which last sum especially your Committee believe the public is receiving no adequate return. It is true there is evidence throughout the report of other work having been done, but this does not conflict with the statement that the large margin is unsatisfactory between the amount paid to the Survey for the years 1881 and 1882, and what the public has, up to this time (1884) received from it. The reports appear, in some instances, as in Mr. Vennor's case, to have been improperly withheld; in others, as in Mr. Fletcher's, to have been suppressed by the Director, with no assigned reason, and in a number of instances to have been so seriously delayed in publication as to render them practically valueless.

In certain minor matters also the Committee find evidence of delay which appears to them unnecessary, and which is certainly very injurious to the success of the Survey. In the report of 1873-74 (page 4) referring to the Museum, we are informed that the work of "re-arranging, re-labelling, numbering and cataloguing the collection, is making satisfactory progress. When it is completed it is proposed to issue a descriptive catalogue, which it is thought will tend materially to enhance the value of the collection, both for educational purposes and for the general information of the public."

In the Report of 1880-81-82 (page 11) it is said:—

"In September, 1881, Mr. A. B. Perry was temporarily appointed for three months as acting Librarian, and during that time he arranged, labelled and numbered nearly all the books in the Library, and made very considerable progress in the preparation of a catalogue."

And at page 28.

"There are now in the Library about 4,500 volumes. The catalogue is being

proceeded with, and will, it is hoped, be ready for printing sometime during the ensuing year."

In one case ten years, and in the other nearly three years have elapsed since the work commenced, and yet no catalogue of either the Museum or Library has appeared.

The Committee must also notice the serious lack of attention to the mining industries of the country in actual operation. Under the administration of Sir William Logan, but little progress had been made in actual mining developments, particularly in the limited sphere of his labours—the present Provinces of Ontario and Quebec. Since his day, not only has the field of practical mining been greatly enlarged by the addition of the Maritime Provinces with their extensive coal and gold mines in actual operation, but in the previous fields we have to note the discovery and development of the iron and gold deposits in Ontario, the phosphates of Kingston and the Ottawa valley, the gold of the Chaudière district, and the copper, iron, and asbestos deposits of the Eastern Townships, yet we look in vain in the present report for any information, either of a statistical nature of their production, or of a descriptive or geological character, as to their progress or peculiarities. Thirteen pages of the last report suffice to narrate the work of the Survey for the last two years, in connection with the mines in actual operation in the whole Dominion. These thirteen pages are devoted exclusively to the mines of the Province of Quebec; two pages embracing the whole account of the copper mines of the Eastern Townships, and it is significant to note that they omit entirely any reference, even by name, to the three mines in most active operation in that district—the Capel, the Oxford, and the Albert—although at the time of the pretended inspection, over 500 men were at work in them, a depth of over 1,000 feet had been reached, upon a continuous vein, the annual output was over 60,000 tons of copper ore, and the cash expenditure exceeded $250,000 per annum.

The attention of the Survey to the mineral and economic resources of the country —its gold, copper, iron, phosphate, lime, gypsum, manganese, &c.—appears to be much less than it formerly was, even although the importance of the subject, and the means of acquiring and publishing information in reference to it, have largely increased.

An attempt was made, in 1871, to secure the statistics of the product of our mines, by sending blank forms to the different mining companies, with a request to furnish full information as to the gross and net result of their operations. Very few replies were received, and the effort was discontinued. The result demonstrated, as has been proven elsewhere, that an officer of the Department must be specially detailed to procure information of that kind, and must overcome the natural prejudice against inquisitorial demands of this nature by personal interviews and explanations. That such information may be obtained, when judiciously sought, is evident from the results of such efforts in the United States, as shown by the volume recently published under the direction of the Geological Survey there, giving the fullest and evidently most reliable details, not only of the quantity and quality of the different ores produced, but of their values, both at the mines and after transportation to market. Nothing could illustrate more forcibly the importance of the subject of the mineral resources of a country, as compared with its other sources of wealth, than the fact established by the returns in question, that the aggregate value of the metals and minerals, including coal, produced in the United States amounted, in the year 1882 to the enormous sum of $453,000,000. The collection of these returns, in this complete form, is a new feature in the management of the Geological Survey of the United States, but its result has attracted marked attention there to the importance of the subject, not only as a guide and incentive to proper legislation for encouraging their mining industries, but as throwing light on the question affecting the fiscal policy of the country.

Even if, in the opinion of the Director of the Survey, its functions did not include the collection and preservation of mineral statistics, still it would seem that the great geological and scientific facts demonstrated by the opening and continued prosecution of these mining industries would attract the attention of the Department, and that a

record of them would he preserved for the proof or refutation of existing theories, and more especially for the guidance of future explorers in similar fields. In the development of the mines before referred to, in which a depth of over 1,000 feet has been reached, geological facts, both of a scientific and geological character, must have been developed, of which no record whatever has been preserved, the existence even of the mines themselves, being apparently unknown to the officer of the staff to whom the duty was assigned of recording the mineral progress of that Province.

An equally significant omission in the Reports in reference to the undeveloped or recently discovered deposits of mineral and other economic resources of the Dominion. Minute attention to particular properties in which minerals are believed to exist, would not be desirable, but the communication to the public of general information, as to the probable extent and chemical characteristics of recognized mineral deposits, and their availability and adaptability to the commercial uses of this and other countries, is certainly a legitimate field for the attention of our Geological Survey, and would tend more to the material prosperity of the country, in attracting the application of capital and proving the value of our resources, than the purely scientific researches so much indulged in, which seem devoted rather to upsetting preconceived theories of antecedent or rival scientists, than to the discovery of new principles or the addition of new information in reference to mineral deposits and mining operations. In the opinion of the Committee, the primary object of the Survey should be, to obtain and disseminate, as speedily and extensively as possible, practical information as to the economic mineral resources of this country, and scientific investigations should be treated as of only secondary importance, except where necessary in procuring practical results. A perusal of the Reports leads us to infer, that the attention of the Survey is directed, first, to descriptive representations of the surface of the country; second, to a scientific dissertation upon the existing geological theories, with the object principally of controverting them; and last of all, to a practical study of the useful mineral deposits, with no reference whatever to actual mining operations. The frequent sketches and photographic views of scenery, the long descriptions of the trivial incidents of the journey, anecdotes of the Indians, dissertations even as to their habits and dialects, while all entertaining, should, in the opinion of the Committee, absorb no prominent part of the attention of a field party sent out to study the geology of the country, and certainly should occupy no portion of the published Reports.

The Committee do not wish to be understood as depreciating, in any manner, attention to field work; they realize fully its importance, and would recommend even that the parties engaged in it be increased in number, but they are of opinion that more practical results should be secured, or at least reported by them. They also think that an exaggerated impression prevails as to their relative cost, as compared with the other expenditures in connection with the Survey. In support of this, the following statement is submitted, which is not asserted to be complete or accurate, but it is as perfect, in those respects, as the information derivable from the Reports themselves will warrant, and is sufficiently correct, at all events, as an illustration of the point now under consideration.—

STATEMENT of Field Surveys as shown by the Published Reports, 1879-80-81-82.

Year.	Person in charge of Party.	Locality.	Cost.	Whether Report Published or not.
1880	Dr. Selwyn	Souris District	$1,204	Published.
1880	Dr. Bell	Hudson Bay	1,945	do
1880	Mr. Ells	New Brunswick	926	do
1880	Mr. Fletcher	Cape Breton	1,259	do
1880	Mr. Vennor	Argenteuil	909	Not published.
1880	Messrs. Ord and McConnell	Berthier	728	do
1880	Mr. Broad	New Brunswick	517	do
1881	Dr. Dawson	Bow and Belly River	3,560	Published.
1881	Dr. Bell	Lake Superior District	2,734	do
1881	Mr. Webster	South-Eastern Quebec	1,051	Not published.
1881	Mr Cochrane	Hudson Bay	1,226	do
1881	Mr. Ells	New Brunswick	1,068	Published
1881	Mr. Broad	do	626	Not published.
1881	Mr. Fletcher	Cape Breton	1,500	do
1882	Mr. Bowman	British Columbia	1,800	do
1882	Mr. McConnell	Rocky Mountains	1,599	do
1882	Dr. Bell	Athabasca District	2,500	do
1882	Mr. Cochrane	Moose River	985	do
1882	Mr. Weston	Lake Huron District	272	do
1882	Mr. Broad	New Brunswick	1,071	do
1882	Mr. Fletcher	Nova Scotia	1,315	do
1882	Dr. Selwyn		1,179	do
1882	Mr. Ells	Gaspé	1,376	Published.

This statement is significant, as showing that the average annual cost of these exploring parties does not exceed $1,400 each, exclusive of salaries, so that in the year of greatest activity, as in 1882, when there appear to have been nine parties in the field, the aggregate cost of the whole out-door service of the Department did not exceed $13,000. As the salaries in connection with the Survey are now chargeable to the Consolidated Fund, the appropriation is virtually increased to about $93,000 or to $60,000, independent of salaries, so that the field service, if conducted on the same scale as in 1882, will only involve an expenditure of about one-fourth of the present appropriation, exclusive of salaries, and there would still be a balance of the appropriation of over $47,000 yearly, for additions to the Museum, engraving of maps, publication of reports and incidental expenses. Your Committee are of the opinion that there should be a sufficient margin out of this large balance to secure the service of a first-class Mining Engineer and Inspector, whose special business it should be to keep himself and the public informed as to all mining developments and progress, and to procure and preserve full statistical information as to the product of our mines, and interesting facts of a geological, chemical and economical character, brought to light by actual mining and smelting operations and experiments. The Committee have examined a large number of witnesses, representing the scientific, mining, commercial and other interests in this Dominion, and have procured, by correspondence, the written views of a still larger number of experts and representative men, of all interests, in other countries, and without a single exception, the advisability of procuring and preserving mineral statistics in connection with our Geological Survey is strongly advocated, both from a theoretical point of view, and as demonstrated by the experience and practice of other Governments. Your Committee believe that this opinion is shared by the members of the Government here, but that the plan has not been adopted, solely on the ground that the field operations of the Survey were of the first importance, and that their cost absorbed the greatest portion of the appropriation.

Your Committee believe that that impression as to cost is an erroneous one, and would strongly recommend that immediate action be taken towards the establishment and maintenance of a Bureau of Mining Statistics, in connection with the Survey. In reference to the field operations themselves, your Committee believe that their enquiries have demonstrated that a change should be effected as to the time and manner in which the results of such surveys are communicated to the public. The "Statement" embodied in this report also shows that a large amount of the work done is practically thrown away, in so far as the public are concerned, and that the publication of the more favoured reports is frequently so long delayed as to greatly impair their practical usefulness. In the present Director's Report for 1871-72 (page 14) he says:—

"Mr. R. Barlow, the draughtsman of the Survey, has made considerable progress during the year, towards the completion of the map of the Eastern Townships, which is being engraved in London, in four sheets, on a scale of four miles to one inch. This map embraces a large region extending on both sides of the St. Lawrence, from Montreal to Quebec, and it is hoped it will be ready for publication next year."

The map is not yet published, although it contained the results of Sir William Logan's work during the last years of his life, and after he had resigned his position as Director of the Survey. Of Mr. Vennor's work in the phosphate region, in 1877, 1878, 1879, and 1880, not a page has ever been given to the public. Of Mr. Broad's explorations in New Brunswick, prosecuted at the head of a surveying party during three successive years—1880-81-82—not a line has ever seen the light. The map illustrating Mr. Fletcher's work in Cape Breton, in 1877, has not yet been published, although it was referred to in the Director's report of that year, and promised for the Report of the succeeding year. (See Report, 1877-78, page 6). Of the field work done by him in 1880 and 1881, in Cape Breton, no Report has yet appeared. No publicity has yet been given to the work done by Mr. Webster, in 1881, in south-eastern Quebec, and of the whole field work of the Survey during the season of 1882, with the exception of Mr. Ells' report upon the Gaspé Peninsula, the public will derive no advantage until 1885. The delay in the publication of these reports is unfortunate, and as your Committee believe, unnecessary, while the total absence of information, expected to have been obtained from the work of such men as Messrs. Vennor, Broad, Ord, McConnell, Fletcher, &c., should receive the special attention of the Government. Each of these gentlemen was at the head of a staff and carried on his operations in important fields and at large expense, but it is not the total waste of expenditure which the Committee regard as of the most consequence. There has been in each case a loss of valuable time and of experience gained, which can hardly be estimated. This branch of the subject leads also to a reference to the fact that, from some cause, the Survey and the country have suffered from a series of resignations and dismissals among the staff, extending from that of Dr. T. Sterry Hunt, in 1873, to that of Mr. Torrance, during the last month, and averaging about one skilled man each year, the result of which cannot have had any other result than great loss to the efficiency and progress of the Survey. These resignations of men who had been originally selected for their natural and acquired qualifications, and who must have greatly added to their first qualifications by years of experience and training in the service, and the necessity of replacing them by new and untried aspirants, must be greatly deplored. The still continued frequency of such changes demonstrates that they are attributable to some permanent cause, which certainly requires investigation.

Your Committee also feel obliged to report that the relations between the Director and some of his staff have been, and are, of such an unpleasant character as to have greatly impaired the usefulness of the Survey. By some of the witnesses this difficulty is thought to result from insufficient salaries; by others, to defects in the temper and tact of the Director; and by others still to jealousy and insubordination on the part of the members of the staff. Your Committee have not felt it to be within their province to investigate and decide as to a defect of internal administra-

tion of this kind, but its existence and the unfortunate effects resulting from it are too apparent to be wholly ignored.

Omitting any reference to matters of detail, like those last alluded to, your Committee beg to report, as the result of their enquiry, that the present administration of the Geological Survey is defective in practical results; that a more systematized plan of its operations should be established, either by additional legislation or by departmental regulations; that the field operations should be confined to subjects more closely allied, practically and scientifically, to a Geological Survey; that Reports of such explorations and surveys, with illustrative maps, should be published, not later than the succeeding season, after the work has been performed; that such reports and maps should, as a general rule, be published separately for each district explored, and at a nominal price, not exceeding the actual cost of printing and binding.

Your Committee beg also to recommend that a Mining Engineer be appointed, with the rank of an Assistant Director, whose province it shall be to inspect and report upon the mining and metallurgical developments of the country, and to procure and preserve a record of their progress, and statistical information as to their product; and desire to add that, in their opinion, these changes and improvements may be effected, under judicious management, without additional expense to the country.

The whole respectfully submitted.

ROBT N. HALL, *Chairman.*

7th April, 1884.

EVIDENCE

TAKEN BEFORE THE

SELECT COMMITTEE APPOINTED by the HOUSE OF COMMONS

TO OBTAIN INFORMATION

AS TO

GEOLOGICAL SURVEYS,

&c., &c.

HOUSE OF COMMONS, OTTAWA, 6th March, 1884.

The Select Committee, appointed to obtain information as to the methods adopted by the Geological Surveys of this and other countries in the prosecution of their work, with the view of ascertaining if additional technical and statistical records of mining and metallurgical development in the Dominion should not be procured and observed, met this afternoon, Mr. Hall in the Chair.

ALFRED R. C. SELWYN, Esq., F.G.S., F.R.S., L.L.D., of Ottawa, Director of the Geological and Natural History Survey of Canada, was called and examined.

By the Chairman:

Q. How long have you been connected with the Geological and Natural History Survey of Canada?—Fourteen years. My first report is dated 1st May, 1870.

Q. Had you any previous connection with the Survey before you were appointed its Director?—No.

Q. And you have continued since to occupy the same position, and you are still occupying it?—Yes.

Q. Please state under what statutory provisions the Geological Survey of Canada is organized and conducted?—Under the Dominion Act of 1877, 40th Victoria, chap. 9, entitled, "An Act to make better provision respecting the Geological and Natural "History Survey of Canada, and for the maintenance of the Museum in connection "therewith." I was requested to look over that Act and made several amendments and alterations in it, which I considered essential, but which were not adopted.

Q. Are these statutory provisions modified in any respect by Orders in Council or other regulations?—No.

Q. So that the Act of 1877 is the only Act under which the Department is organized and conducted?—Yes; always excepting the details of administration. The Act does not go into the details of administration; that is left to the Director, subject, when considered important, to the approval of the Minister.

Q. Are there any by-laws or published regulations for the internal regulation of the Department?—No, there are no published regulations. Each officer has his duties, which are set forth in the Estimates, which specify the salaries and titles.

Q. Then I understand there is no written designation in the Department of the responsibility and function of each subordinate officer?—Yes, that is specified in the

Estimates. It is well understood, in the organization of any Geological Survey, that the title implies the duties of the officer. Of course, these duties have occasionally to be modified according to circumstances; if one officer has a great deal to do, the others are supposed to help him—that is, mutual assistance is rendered wherever it is possible to do so.

Q. But any modification of the existing relations would be at your own suggestion, and it would not be necessary to refer it to any other?—No; except as specified in previous answer, I am supposed, after having forty years' experience in conducting Geological Surveys, to be able to know what is required, and the best means of doing it.

Q. My enquiry is rather as to whether the gentlemen composing the staff have the means themselves of knowing what their duties are?—Certainly they have.

Q. How do they know?—They are instructed; but they ought to know this without instruction. If I engage a draftsman I suppose him to know how to carry out the work he is asked to perform, and in like manner with a Geologist, Botanist or other officer.

Q. By whom?—By me.

Q. Verbally or in writing?—Verbally, and in writing too, to some extent. It would be impossible to write out the details of what has to be done from day to day. The duties of the Curator and Assistant Curator of the Museum have, of course, to be done from day to day, but the very name of "Curator" implies the duties which that officer has to perform. There is one Curator for the Mineralogical Department and another for the Natural History Department, and so on, and each man is supposed to understand what the duties of his position are and to carry them out. They are under my control, and I suggest to them what should be done. But in all this we have to be guided in a great measure by the means at our disposal, whether we can or can not get anything done, and therefore no hard and fast instructions can be given. There is an Accountant and a Secretary to look after the correspondence, and a Chemist and an Assistant Chemist, and the work of all these different branches should be so thoroughly understood by the gentlemen in charge that it should not require written instructions, but it does want constant consultation as to the best way of illustrating facts, which we have to study, and how best to do this is dependent on a variety of circumstances.

Q. What is the present staff, and what are their relative responsibilities and salaries?—They are fully detailed in the Estimates. I can furnish a list of the permanently appointed officers; I cannot repeat all the names.

Q. But we might at least get at the principal officers of the staff?—There is a Director, which is myself, and there are four gentlemen who are nominated as Assistant Directors, each one with their special duties. Dr. Bell and Dr. Dawson are Assistant Directors for field service; Mr. Whiteaves is Assistant Director for Museum work and Paleontologist and Naturalist, and Mr. Hoffman, Assistant Director for the Mineralogical Branch and Chemist. These are the four principal officers. There are a certain number of field geologists and assistants, and then very often we have to engage assistants as draftsmen, because it is frequently found that the field geologists cannot work out all their observations in the summer and draw the maps, which are very essential, and therefore we have to hire extra assistants for that work. Prof. Macoun is Botanist.

Q. What is the relative rank of these different offices?—They rank according to their salaries. The four Assistant Directors rank equally. They receive the same salary, and the rank, in a great measure, is fixed by the salary.

Q. And they rank equally, so far as responsibility to yourself is concerned?—Yes. Of course they always submit anything they propose to do to me for my approval; that is, when it is possible to do so. When they are in the field, they are personally responsible, and have to act as circumstances necessitate, reporting subsequently to me.

Q. Do you consider the present system under which the Survey is conducted, efficient and successful?—In most respects it is, but in others it is not. A system

obviously depends upon circumstances. For instance, a Geological Survey must be adapted to the peculiar local circumstances. We have to deal with a country 4,000 miles in extent, from east to west, and the character of each section has to be judged by itself. In the remote and unsettled regions we have a different system from that used in the settled regions; and the work is not done in the same detailed manner. It will be quite apparent that a number of systems is required and that no one system suits all the circumstances we have to deal with. The system to be adopted is also greatly dependent upon the information in existence, such as good topographical maps. Where maps are available we do not need to do topographical work, but where they are not, we are absolutely compelled to do so; and inasmuch as over the whole of this Dominion, or by far the larger part of it, at any rate, there are absolutely no correct maps, we have to do topographical before geological work, and by far the larger part of our time is taken up with this work. This should not be the case. The Geological Surveys of European countries have nothing to do with topography. It is an entirely separate department; but in new countries like Canada and Australia, it has to be done. In Australia, where I was for seventeen years, Director of the Geological Survey, I had to do the same thing, and to make similar topographical maps with the greatest minuteness. Here is a map (the witness here submitted a topographical map of the Victoria Survey, Australia, to the inspection of the Committee), which in execution is equal to the maps in Great Britain, it was made by the staff of the Geological Survey. It is about as perfect a geological map as you can have, but it involved an immense amount of time. Millions of pounds sterling of ore have been taken out of the area represented on it. I have a map of New Brunswick here, but there are no hill features on it. A geological map without orographical features is of very inferior value, because geology is so intimately connected, with these that they are explanatory of each other. It is proposed to carry out this system in Canada, wherever circumstances admit of its being done. The location of every known mineral deposit of value is likewise given. Of course we do not tell people that they can makes fortune at these places. It is the duty of the miner to find out the quantity of the ore, but it is our duty to show him where it can be found. I propose to issue an edition of these maps, leaving out the geological colours, and showing the location where the various minerals are found, so that any one can go straight to the place.

Q. How many of these maps have been published since your connection with the Survey?—I have some ten or twelve, at any rate, with those now being engraved. They embrace nearly the whole of New Brunswick and the south-eastern part of Quebec, Cape Breton, &c. The north-western part of Quebec has not been published as a geological map yet. It was issued by Sir William Logan, but it was thought better to issue it only as a topographical map. The location of all the valuable minerals is marked on it, so that it is valuable as a mining map.

Q. How does the efficiency and standing of our own Geological Survey compare, in you opinion, with those of corresponding Geological Surveys of other countries?—That is an awkward question for me to answer. The best way perhaps for me to do so, is to refer to letters which I have received from gentlemen in all parts of the continent, such as Mr. Raymond, United States Commissioner of Mines; Mr. Broadhead, Director of the Missouri Survey, and others. Professor George H. Cook, of the State Geological Survey, of New Jersey, writes, under date of 11th February, 1881:—

"Dear Sir,—It gives me much pleasure to acknowledge the receipt of the "Report of Progress of the Survey under your charge, for 1878-79—a gift from the "Government of the Dominion of Canada. The work is highly appreciated, and is "very useful to us, and I beg you will tender my thanks for it." Professor Hitchcock, of the New Hampshire Survey, writing under date, October 5th, 1881, says:—"Much "obliged to you for your scheme of geological nomenclature and maps. You speak "of a map of part of the Canadian North-West Territory, as included with the maps. "There was no such sheet in the package sent me. I like your ages, except the first, "which had a Canadian origin; I shall say eozoic and archean, and there is a "strong party of United States geologists who agree with me in this particular." Mr.

G. K. Gilbert, of the United States Geological Survey, in a letter to me dated, Washington, October 27th, 1881, says: "I have received your favour of October 24th, and "the accompanying index sheet of the Canadian map, which I am very glad to see." After referring at some length to the Bologna Congress, the letter concludes as follows:—"I beg you will excuse me for criticising the Canadian scheme. Further "than that the printing of the letters designating the formations and other geologi-"ical matters, in a colour distinct from the topography of the map, is to my mind, "a better device than the one which we employ, and I hope that Major Powell will "be led to adopt it when, after the report of the Congress, the question of revising "our scheme must come up." Mr. Gilbert, under date October 19th, 1881, also says: "I have the pleasure to acknowledge the receipt of your paper on geological nomen-"clature, with accompanying maps, and have read it with a great deal of interest." Prof. W. C. Kerr, State Geologist, of North Carolina, under date October 15th, 1881, writes:—"I thank you for the copy of your new geological map. I like your scheme "of the grand division of the rocks, and the colouring, as far as I have been able to "examine it, and I am fortunate in getting the results of your labour in this line, "before attacking the same problem here, as I shall have to do this winter, in making "my geological map." Mr. C. E. Dutton, of the United States Geological Survey, writes me under date Washington, January 31st, 1881, and says: "I have the honour "to acknowledge the receipt of the Report of Progress for 1878-79, from the Canadian "Survey. I have read the work with much interest, and beg leave to express my "high appreciation of the ability, candor and intelligence with which the work has "been prosecuted. Great credit is due alike for the direction and field operations." Mr. W. R. Smith, of Belleville, whom I do not know, but who writes as Secretary of the Marcheson Club, Belleville, under date January, 1880, says: "I beg to acknowledge "the receipt of the Report of Progress for 1878-79. It seems to be a very interesting "Report, and the description of the Queen Charlotte Islands and their inhabitants a "very important contribution to scientists. We look upon the Report as the best part "of our library." Mr. White, Curator of Paleontology in the United States National Museum, under date Washington, January 31st, 1881, writes: "I have the honour "to acknowledge the receipt, by mail, of the Report of Progress of the Geological "Survey of Canada, for 1878-79. It is a very valuable contribution to the literature of "North American geology, and as such, it will receive a cordial welcome from all "persons interested in geological investigation. I beg to present my sincere thanks "for the donation." Prof. E. W. Claypole, of Antioch College, Yellow Springs, Ohio, writes: "Many thanks for the Report of Progress for 1878-79, for which I am, "I suppose, indebted to your kind thoughtfulness. I have as yet only dipped into it "here and there, but I feel inclined to write a line to express my satisfaction at the "stand you have taken in regard to the nomenclature of the palaeozoic rocks." And then follows a scientific discussion on this question.

Q. You might feel a delicacy in expressing an opinion of the work of the Survey, so far as your own administration is concerned, but you might give us ideas as to its value on other points; for instance, its relative efficiency to the amount of money expended?—I prepared a document on this subject, at the request of Sir John Macdonald, a good many years ago.

Q. But it still expresses your views?—Yes. The document is as follows:—

GEOLOGICAL SURVEY OF CANADA.

SIR,—Adverting to the conversation which I had with you on Friday the 11th inst., and in which you requested me to furnish you with a memorandum, showing what changes, I considered, were required in the organization of the staff of the Geological Survey, with a view to expedite the progress of the Survey, and to render it more complete and effective, I now have the honour to submit the following report for your consideration.

In framing estimates for carrying out geological investigation, they may be based, either upon the wealth and resources of the country which has to be examined, or upon the extent of the area over which the observations have to be made. If

based upon the latter consideration, it is needless to say, that in Canada, the fields in which it is highly desirable and important that geological explorations should be undertaken, either for scientific purposes, or for reasons more directly connected with their immediate practical and economic value, are almost co-extensive with the area of the Dominion, and the estimate of the expenditure which might be deemed to bear some relative proportion to the work to be done, would probably greatly exceed the amount, which, under existing circumstances, could be provided. In making the estimate submitted herewith, for the Dominion Geological Survey, I have, therefore, been guided, rather by the former than by the latter consideration.

In comparing the results, and in considering and providing for the cost of such works, in new and in old countries, it is necessary to bear in mind, the very greatly superior facilities afforded for their prosecution in the latter, and it will then be apparent, that in order to produce results in the former, even approximately equal, a very much larger expenditure is required than in the latter.

In the United Kingdom, and in other European countries, where Geological Surveys are in progress, the geological explorers have no difficulty in procuring reliable and accurate topographical maps, on which to record their observations. Here, on the other hand, their geological investigations have to be preceded by the making measurements for the construction of topographical plans, and the geologistswho are supposed to devote their attention to geological and scientific studies, are really carrying on a combined topographical and geolgical survey, and the work connected with the former is that to which, usually, the larger share of the expediture is devoted. In settled countries they are not compelled to resort to speeial, and by no means luxurious, the often costly means of transport and modes of living; they are not subject to severe bodily toil; to exposure in all weathers, and to personal risks; all of which are inseparable from the work here. And almost unaided, they can perform an amount of work, to do which, in this country, they must each be accompanied by a staff of four or five assistants, all of whom have to be paid, transported and fed, at considerable cost.

As in some measure compensating, however, for this increased expense, it may be pointed out that the result may always be made to include valuable information of various kinds, the obtaining of which in older settled countries forms no part of the duties of the geological corps, but is otherwise acquired often at considerable expense to the State.

The Geological Department of the United Kingdom is divided into three sections —the Museum of Economic Geology; the School of Mines; and the Geological Survey, and is carried on at an annual cost of about £31,000.

The work appertaining to each section is performed by a separate staff of well-paid and experienced officers. The organization of the Geological Survey consists of a Director-General, assisted by three local Directors, one for England and Wales, one for Scotland, and one for Ireland, and working under them there are four district geologists and eleven geological explorers, making a working field staff of nineteen geologists.

The lowest salary paid to the geological explorers on the English Survey, is £350 sterling per annum, equal to, say $1,700 per annum. On the Canadian Survey, men who are supposed to be capable of doing similar work, are paid from $800 to $1,400 per annum.

In any scheme for the enlargement of the operations of the Canadian Survey, the securing the services of a certain number of well-trained geological surveyors, is an essential element, but it will be readily seen from the foregoing remarks, that there is no likelihood of being able to do this unless the rate of remuneration for the services required is made at least equal to that which such services command elsewhere. It is also, I think, essential that the Director should be in a position to guarantee the continuance of the appointments during good behaviour, or in other words, that the Survey should be regarded as a permanent Branch of the Service. Without some, such guarantee, well trained and efficient men would not be induced to join the ranks of the Survey, nor regard it as a field in which they might

hope, by energy and industry, to gain credit and distinction in their profession; and they would rarely take that interest in the progress and success of the work, which they would do if assured of being permitted to carry it to completion.

With the changes above suggested carried out, there would probably not be much difficulty experienced in gradually organizing an excellent and thoroughly efficient corps of geological observers for the Dominion from amongst the students of the mining schools of Europe, the United States and Canada.

I may now proceed to show what, in my opinion, the organization of the Canadian Geological Survey should be, in order to attain a reasonable amount of annual progress in working out the geological structure and in determining, with some degree of precision, the value and extent of the mineral resources of the vast area of country embraced within the limits of the Dominion.

One Director.		
One Assistant Director for New Brunswick and Nova Scotia, with	3 field geologists.	
One Assistant Director for Quebec and Ontario, with	4 "	
One Assistant Dirictor for Manitoba and North-West Territory, with	4 "	
One Assistant Director for British Columbia, with	4 "	
Total field staff, 19 geologists, salaries		$38,000
Contingencies, including labour, provisions, camp equipment, boats, canoes, waggons, horses and travelling charges		25,000
The organization of the Palemtological and Chemical branches, and the Museum, library, office and mapping departments, would remain as at present, with such additional assistance as would be requisite to meet the increased work which the enlarged field operations would entail on them, and the total cost of these, including salaries and contingencies, could not be estimated at less than		22,000
Total		$85,000

For the reasons already adverted to, and for others equally important, in connection with the systematic conduct and the uninterrupted progress of the work, such measures should be adopted as may be necessary to ensure the annual appropriation for geological purposes being voted for a period of years, and that any unexpended balance in each year should be carried to the credit of the fund, and be made available for the service of future years. Two or three seasons would probably elapse before the field staff could be organized on the scale of efficiency herein recommended.

I have the honour to be, Sir,
Your obedient servant,
ALFRED R. C. SELWYN.

Right Honourabl
Sir J. A. MACDONALD, K.C.B., &c., &c., &c.
Ottawa.

By Mr. Baker:

Q. In what year was that Report made?—I think it was in 1873. No action was, however, taken and at that time the Survey was getting only $30,000. The vote was increased gradually, year by year, until last year, when a substantial addition was made to the annual vote. Up to 1st of July, 1883, the whole cost of the Survey and Museum, including all salaries and contingencies of every kind, were paid from the annual vote.

By the Chairman:

Q. That was a grant of $60,000?—Yes; I only had $45,000 the two years before that; previous to that I had $30,000 and before that again, $25,000.

Q. But at present you receive the $60,000, and the whole of the staff appear on the Civil List?—Yes.

Q. And their salaries appear on the Civil List?—Yes.

Q. Practically, how much does that add to the grant?—This year, 1883-84, $30,503.

Q. So that the total would be what?—$90,503. Since this the whole of the expenses have increased. As an instance, the one item of stationery which in Montreal never averaged more than $300, here in 1881-82 was $611.89 and last year amounted to $455.72. In Montreal each officer found his own private stationery; here all receives it at the cost of the Department. The Museum is much larger and the staff greatly increased. We have doorkeepers, messengers, carpenters and night-watchman; none of whom were on the staff in Montreal.

Q. Can you suggest any changes in our present system which would, in your opinion, improve its efficiency? If so, what changes would you recommend, and how much increased expense would such changes entail?—There are several changes which, I think, would very much increase the efficiency of the Survey. The most important, perhaps, is that the topographical work should be entirely separate from the duties of the geologist. Men who are geologists, such as Dr. Dawson and Dr. Bell, should not have topographical work entailed upon them, but there should be a topographical surveyor attached to each party, whose duty it should be to go in advance of them to make topographical surveys in whatever detail might be suggested to the him by Geologist as being advisable,or necessary, or possible. This is done on the United States Surveys. People are apt to think here that a land surveyor is a topographer, but a man who can simply run lines for land surveys is not a topographer. He may be, but, as a rule, he is not. You will see the salaries in the United States in their report. Here, they get from $4 to $2 a day, but in the United States they get $1,800 a year, as much as the best geologists on our Survey. We get young men with little training and experience, but in the States the very best men are selected, because they find that they can get on better with their work. The Director-General there gets $6,000 a year, and he he has no larger extent of country than I have to superintend; he has no Museum to look after, and has no greater responsibility. Has four assistants—first-class trained men, at $4,000 a year, while I have four at $1,850 a year, and my own salary is only $4,000. It is unreasonable to expect such a staff to carry out work of the same character as the United States Survey does. We cannot do it, and more good and experienced men is one of the greatest improvements required, and the change which would add most to the efficiency of the Survey.

Q. Do you mean that these salaries would command better talent or more work?—Better talent; and better talent means more work, and good work. We get young men who have come from local colleges; they have done very well, and are nice, pleasant, intelligent young men, but they have had no training or experience, and we have practically to train them. That is not done in a day; it takes years. We may have them for two years, and then they become dissatisfied. They are, perhaps, very good men, very good surveyors, but have not the slighest taste for scientific or geological research, and yet, if they do not get paid the same as the best men, they find fault. There are few of them who can write a report, and it requires an immense amount of labour to make such reports even readable.

Q. Then I understand that you think it would be better to have a staff from abroad?—I do not care where they come from, so long as they have had the training. I want to know, when I send a man out into the field, that he is able to do the work, so that I will not have to do the work for him when he comes back.

Q. Do you not think that the greater familiarity which the young man who is born here has with the geography of the country would counterbalance any superiority in those educated abroad?—Most of them know very little about the geography of the country. It is perfectly astonishing how little they know. They are naturally

not as well educated as those coming from abroad. For instance, they go to our local colleges and study there, and they come into competition with only a small number of men, and still they think they are as well educated as a man who comes into competition with perhaps 100 men; they take a standing among half a dozen and they think that equal to a standing among 200 or 300. Only the other day a young Canadian on the staff—a very capable writer and a hard worker—came and told me he wanted a collection of rocks to examine, when I said to him: "Have "you never been into the Museum, and are you not aware that there is a collection "of rocks all labelled and ticketed there." That man has been on the Survey now for seven or eight years. What can you expect from a man with so little observation as that. Topography should be distinct from the geological work, and there should be a paid topographer attached to each party.

Q. Would you limit your suggestions as to changes in the system to that single one?—The Director should have unlimited power to select his assistants from the very best persons he can find, regardless of where they come from, or who they are, except that they understand thoroughly their duty, and that they can give some previous guarantee of knowledge and work. He should, moreover, have ample power to dismiss them, if he finds them incapable; and, unless such power is granted, he cannot be held responsible.

Q. Have you not that power?—No; I can make complaints, and ask for an investigation; but that is a very long process, and a very unpleasant one.

Q. As a matter of fact, there have been a good many changes in the staff since your connection with it?—Yes; both by death and resignation. Some of the best have resigned to take better positions, and some have resigned for other causes. There is a clause in the regulations of the United States Surveys which, I consider, should be strictly enforced on the Geological Survey of Canada. In the Report of the Committee appointed by the United States Government to enquire into the system of the United States Surveys, which is a very interesting and useful document, the following paragraph appears: "It should be specially provided that the Directors "and members of the Geological Survey, charged, as they are, with the investigation "of the natural resources of the public domain, shall have no personal or private "interests in the lands or mineral wealth of the region under survey, and shall exe-"cute no service or examinations for private parties or corporations."

Q. Has there been any ground for complaint in this particular?—Yes; one gentleman resigned for that reason—simply that he was speculating in phosphate mines for other people and neglecting his duties entirely, and travelling up and down from Ottawa and charging his travelling expense to the Survey. He was buying phosphate lands himself and speculating in them, and these facts are within the knowledge of many gentlemen in Ottawa. There have been other resignations of that kind. I told another gentleman who resigned, that he was an able man, but he had never had any training in geological work. He was a land surveyor—a strong active man, not specially industrious, but still did that kind of work very well—but when he attempted to write a geological report, it was simply valueless. Ther is a gentleman on my staff who is just the same—a very neat draughtsman and good topographer, but in no sense a geologist. None of these were men of my selection, but I had to make the best use I could of them. None of them have had any training to fit them for the work, and you cannot expect them to do work for which they have not been trained, any more than you can expect a man to follow either medicine or law as a profession without special training.

Q. There were some more important changes in the early history of the Survey. Who comprised the staff when you took over the Department?—Sir William Logan, who asked me to succeed him as Director, Dr. T. Sterry Hunt, as Chemist; and Mr. Billings, as Paleontologist. Immediately prior to that, Mr. Alexander Murray was the Chief Geologist, so that there were only these four appointed officers. Then there was Mr. Richardson, whom Sir William stated had formerly been a farmer, but who had become a valuable and indefatigable explorer. He was a very honest man, but his

reports were all written either by Sir William Logan or myself. I have had to do that in several cases.

Q. All these gentlemen are not still connected with the Survey?—Mr. Billings is dead, Dr. Hunt has resigned, and Mr. Murray was transferred to Newfoundland and has carried on the work there, until last year, when he resigned on account of old age. Mr. Murray left for Newfoundland before I came here, and the other chief assistants were Mr. Richardson—now dead—and Prof. Bell, who has been working on the Survey with one interval, ever since.

By Mr. Holton:

Why did Dr. Hunt resign?—He resigned, I think, from a feeling of irritation against Sir William Logan for not nominating him as his successor. So far as I know, that was his reason. He certainly did, at that time, having previously entirely concurred with Sir William Logan in all his views, when I came out, begin to change his views, and I asked him to explain these things, and what was the reason of this change, to which he replied: "Well, Mr. Selwyn, the fact is I had to shut my eyes to some things, "and make others appear what they were not." I told this to Sir William Logan, and the result was that he went over all his work again, and when he began to go over it he found that mistakes had occurred, and the result was, he died in the prosecution of this work, and never left any statement about it. Dr. Hunt has accused me of supplanting him. I know nothing about this, except that Sir William Logan—who knew that I had been connected with the British Survey in 1845—asked Sir Roderick Murchison and Prof. Ramsay (now Sir Andrew Ramsay) to recommend some one, and they suggested to him, that I would be the best person. I was very glad to accept it, as it was a much wider field than I was working in in Australia. In answer to Sir William Logan's letter, I asked him whether I would not be considered, more or less, an interloper, and if there was not someone already on his staff who was entitled to the position he was asking me to take. The only man he might probably have recommended was Mr. Murray, and he had gone to Newfoundland. These are the exact facts about my appointment, so far as I know. When Dr. Hunt resigned, I had to look out for another chemist, and I offered the position to Dr. Harrington, who was the chemical lecturer at McGill College. It was a very small salary, but it left him free to carry on his lectures, as well as his work on the Survey; and he accepted. There was another assistant then, Mr. Gordon Broome, and after he left I found Mr. Hoffman, who is the present chemist, and who had been chemist to Baron Von Muller, the Government Botanist in Victoria, Australia. He was there carrying on investigations in organic chemistry, for Dr. Muller, and knowing his experience I recommended him as assistant to Dr. Harrington. When Dr. Harrington, however, was appointed Professor in McGill College, he found that the combined work was too great, so he resigned his position on the Survey, and Mr. Hoffman was appointed in his place.

By Mr. Ferguson:

Q. You say that no first-class talent can be got from other countries without first-class salaries?—Certainly not.

Q. And that all the talent, under the present circumstances, must necessarily be inferior talent?—Certainly, except in certain rare cases, in which pay does not enter into the consideration.

HOUSE OF COMMONS,
OTTAWA, 7th March, 1884.

The Select Committee on Geological Surveys met this afternoon, Mr. Dawson acting as Chairman.

ALFRED R. C. SELWYN, Esq., F.G.S., F.R.S., L.L.D., of Ottawa, Director of the Geological and Natural History Survey of Canada, was again called and his examination continued.

By the Chariman:

Q. At the last meeting of the Committee, Dr. Selwyn, you were asked to make any suggestions which you thought fit, with reference to improvements which might be made in the organization of the Geological Survey of Canada. Have you prepared any suggestions?—I have prepared the following suggestions:

1st. Separation of the Geological and Biological work from that which appertains to topography and mensuration.

2nd. Full authority to the Director to select his assistants and to dismiss those who are found to be inefficient. This would rarely occur if clauses 3 and 4 were attended to.

3rd. Salaries to be made more in accordance with those which similar duties command in other countries. In this connection, the United States and the British Surveys may be cited.

The salaries of the United States officials are given in the report of the United States Survey, and those of the British Survey in Whitaker's Almanack. I may mention that the Director of the Geological Survey of the United Kingdom, who was my junior—he was an assistant on the Survey when I went to Australia—gets £800 sterling a year, which is exactly my salary here, and in addition he gets £300 a year as Director of the Museum, and he also now gets £600 as Director of the Scotch Survey, so that altogether he gets £1,700 sterling a year. The Director of the Geological Survey of the United Kingdom is Professor Archibald Geikie.

By Mr. Holton:

Q. Are his duties not more extensive than yours?—Well, can you imagine the duties that are required to supervise a Survey of the extent of Great Britain, and those which are required to supervise a Survey of the extent of the Dominion, as being so.

Q. I understood you to state yesterday that there were departments connected with the British Survey which we have not here—for instance, the School of Mines?—Yes; no others.

Q. Is he in no sense responsible for it?—I do not know. In his present position as Director-General he gives no lectures. He has, I suppose, the supervision of it, but that is a very light duty. The following are the remaining suggestions which I have prepared:

4th. No students to be placed on the staff or attached to field parties, under pay, who have no intention of making science their profession, and then only on furnishing such guarantees as may be required, of their fitness for the duties required.

5th. Some increase in the Chemical Section would be desirable, so that the Chief Chemist should have more time for original researches. The same remark applies to the Biological Section.

6th. The appropriation for the maintenance of the Survey and Museum, should be made annually on the terms recited in the Act of 1868 and the salaries of the whole of the employees should be paid from it. No useful object is attained by making some of the salaries chargeable to the "Civil List." To do so, neither adds to nor diminishes the total cost of the work, while many of the rules and regulations which are applicable to the other branches of the Civil Service are quite inapplicable to a purely scientific branch—indeed, may be said to often seriouly interfere with its efficiency and progress.

7th. In view of the present numerical strength of the staff and the enormous extent of the country, much better results would, in my opinion, be obtained by greater concentration. But the requirements of the several Provinces and territories, all desiring immediate attention, have hitherto prevented this.

8th. No officer of the Survey, should under any circumstances, hold any direct or indirect pecuniary interest in any mine, mineral lands or timber limits in the Dominion, nor receive any remuneration for any report or opinion he may give to persons, individuals or companies who are so interested.

By Mr. Holton:

Q. One of the chief objects of this Committee is to ascertain how the practical utility of this Geological Survey of ours can be extended?—These suggestions are exactly in that direction. I must differ from you in that respect.

Q. These are suggestions for the improvement of the Survey?—That means the greater practical utility.

Q. There is, as everybody knows, a general complaint in the country?— No, Sir, I do not know. I know there are certain persons who make complaints, but they are either persons who have no experience and know nothing about geological surveys, or they are disappointed office-seekers and others who have been found to be incompetent. If they have any complaints, let them formulate them, so that they can be answered. If you enquire of impartial geological scientists there will be no such complaints.

Q. I refer to the feeling which exists in the minds of the people generally. I do not, for example, pretend to be a scientist, and it is not possible for me, therefore, to make such complaints as you hint at, nor is it likely that such complaints would be made to me by others. But, as one of the public generally, there are complaints?—Is there any institution of which there are no complaints made. Let any individual make a definite complaint, so that it can be properly answered.

By the Chairman:

Q. Mr. Holton is speaking of the general expression of opinion throughout the country. To conduct the Survey in a scientific manner, requires a gentleman of high standing, but with regard to the practical work, it is generally supposed that the Survey has made very few discoveries?—A very wrong supposition, and that it is so is easily proved.

Q. Well, of course you have reported on the geological features of the country and of the different sections, but it is generally supposed that you have rather reported on what is already known, to a certain extent. This is, of course, highly interesting and very useful, but it is supposed that, with regard to new discoveries, as to mines, &c., the Survey has not made much progress?—That is, I know, a very general impression, but is it true?

By Mr. Holton:

Q. The sort of complaint which is in the public mind is not a complaint which can be formulated in the way Dr. Selwyn suggests. Who is to formulate it?—Surely the individual who makes the complaint could formulate it.

Q. But it exists very generally throughout the country. For example, I know as a fact, that that there is a pretty general feeling in this country that, from a scientific point of view, the Survey does not occupy the position which it did some time ago. There is also a feeling that the Geological Survey has not accomplished as much for the public good as it should, and that nothing practical is being done. There is a demand for increased practical utility, and this is one of the main objects of this Committee, and on these points I, for one, would like to hear Dr. Selwyn give his views?—There are a certain number of persons in this country who make these complaints, and very industriously spread them. Now, I think that any person who is so ignorant as to spread these complaints, or any number of persons who agree in making them, should certainly point out some facts in support of their allegations.

Q. I am not speaking on behalf of dissatisfied employees of the Survey, but on behalf of the public.—You cannot separate one from the other.

Q. But I do represent them. I should be sorry to represent the malcontents?—It is impossible to answer these allegations; they are not supported by a single fact, except such as can be traced to those persons you just alluded to.

By Mr. Cameron:

Q. I may refer to a complaint which reached me more than once during the last two years from Eastern Nova Scotia. It is, that maps have not been published in connection with the reports of the Geological Survey of that section of the country, and the people say that these reports are practically valueless without these maps accompanying them. Complaints have been made in Parliament many years ago, but since my arrival in Ottawa this Session, my attention has again been called to this state of things from the East, and these complaints do not come from any malcontents?—That cannot be supported by facts. The maps and reports speak for themselves. There are certain delays, but they are insuperable. For instance, the Messrs.

Burland, who do this work, have had maps in their hands, of that very district, since this time last year.

Q. The reports which I refer to were published three or four years ago?—The maps have been published, too.

Q. But no maps connected with the Counties of Inverness and Victoria?—Yes, most distinctly; not the whole of it, it is true, but a very large portion of it.

Q. But the maps connected with the most important parts of the report are not published?—These complaints come from every Province in the Dominion, because each Province wants impossibilities. Now, each Province here is as large as the whole of Great Britain, and I would ask anyone if it is reasonable to suppose that, with such a staff, as there is at present, it is possible to publish maps of the whole Dominion promptly.

By Mr. Mulock:

Q. Yesterday, Dr. Selwyn, you mentioned that in England they had three divisions of Geological Service?—Yes.

Q. One of them you mentioned as being the School of Mines?—Yes.

Q. What is there in Canada corresponding to that school?—Nothing, except the courses of lectures at the Universities.

Q. Nothing in connection with the Geological Survey?—No.

Q. What work is done by that school in England?—They have courses of lectures, similar to those given in the Colleges here.

Q. It is simply theoretical instruction?—Yes, and lectures.

Q. No practical work?—There are a series of mining models, showing the practical mode of working mines, timbering, &c. Three are explained to the students.

Q. I call practical work, taking a man into the mines; and I call theoretical work, work done in colleges and schools?—They do not take their students into the mines.

Q. Then that is theoretical work?—I differ from you in that respect; it is scarcely to be called theoretical work, if you take a man and show him the methods of timbering and of putting up machinery, &c.; that, I consider, to a great extent, practical work. They never take their students into the mines, as far as I am aware.

Q. What are the other two divisions?—The Museum and the Geological Survey.

Q. These two we have here?—Yes.

Q. You spoke about the salaries paid by the Dominion as being insufficient to provide you with proper material?—Yes.

Q. Then, I should infer that, in your opinion, you have not the necessary quality of material?—No.

Q. Of whom do your staff consist?—The chief members of the staff are Dr. Robert Bell, Dr. G. M. Dawson, Mr. J. F. Whiteaves and Mr. G. C. Hoffman.

Q. What does Dr. Dawson do?—He is Chief Geologist and Assistant Director for field work.

Q. What are his qualifications?—There is no man in this Dominion better qualified for the work, and he only gets $1,800 a year; he should get more like $3,000.

By Mr. Baker:

Q. Is he the next in seniority to yourself?—He is not next in seniority as regards his time on the Survey. There are many who have been much longer on the Survey, but I certainly hold him to be the senior in qualifications.

By Mr. Mulock:

Q. What duties has he performed since his appointment?—Those of a field geologist.

Q. In what part of the country?—Chiefly in British Columbia and the North-West.

Q. For what period of time?—Since the date of the boundary survey.

Q. Then whatever reports you have published in respect to British Columbia are the result of his investigation?—No; there were reports published of British Columbia before he joined the Survey, both by myself and Mr. Richardson, now deceased.

Q. Then, you and Mr. Richardson and Dr. Dawson made the surveys for all the reports in respect to British Columbia?—Since then, Mr. Amos Bowman, who now works as Dr. Dawson's assistant.

Q. Since when?—Two or three years ago.

Q. But the printed reports show the result of their investigations?—Yes.

Q. There is nothing to their credit that is not disclosed in the reports?—Nothing that I am aware of.

Q. Who appointed Mr. Bowman?—Mr. Dawson selected him as his assistant.

Q. Are you satisfied with him?—Yes, so far as I know. He is not a trained geologist but a very good explorer and topographer.

Q. When did Dr. Bell enter the Service?—On the 1st July, 1884, he will have been twenty-five years and six months in the Service, with a brief interval, when he became a professor at Kingston College.

Q. You have been here seventeen years?—Yes.

Q. Then he was here when you came?—Yes, and long before.

By Mr. Holton:

Q. How long has Dr. Dawson been in the service?—Nine years and six months.

By Mr. Mulock:

Q. What have Dr. Bell's duties been?—Similar to those of Dr. George Dawson—field geologist.

Q. In what part of the country?—Chiefly, since 1869, in the region east of Lake Winnipeg, and north of Lakes Superior and Huron, to the shores of Hudson Bay, On one occasion he went west to Qu'Appelle, in the North-West Territories.

Q. Has he had any assistants?—He has had a number of assistants all the time.

Q. Are the results of his labours disclosed in the printed reports?—Yes; over his own signature, and in his own words.

By Mr. Holton:

Q. Published at length?—Yes.

By Mr. Mulock:

Q. What do you say as to Dr. Bell's qualifications?—There is a great deal to be said about it. I have not been altogether satisfied with his mode of conducting the work.

Q. On what ground?—I have been constantly informed that his statements were not reliable. The most recent is that of Dr. Rae, who writes, signing his own name, that if Dr. Bell's statements about other parts of the Hudson's Bay are as incorrect as that regarding the southern parts of it, they are of little value.

Q. Where does this appear?—In the *Canadian Gazette* of 4th May, 1883.

Q. What other reasons have you for discrediting his reports?—Simply from such statements as Dr. Rae's.

Q. Is that Dr. Rae the Arctic explorer?—Yes. I have had other statements about his work, and I have no objection to name them, but I do not think they should be published.

Q. If men are to make charges reflecting on the efficiency of certain members of your staff, I certainly think the names should be given of the persons making the charge?—I have no objection.

Q. You produced a piece of testimony yesterday which I thought utterley valueless—I mean, a letter from Mr. Smith, of Belleville. If you had not given us the name I would have thought nothing about the matter, but I regard such testimony as utterly valueless?—I know nothing about him. I gave you a number of letters, and said I did not know the persons who wrote them, but they might be taken for what they were worth.

Q. You are not at liberty to mention the names of the other persons, then?—I am at liberty to mention the name of Sir William Logan, who is now dead, but no other person.

Q. What did Sir William Logan tell you?—He told me that Dr. Bell's work was not reliable.

Q. When?—Fourteen years ago.

Q. Did you ever report that matter to the Government?—No.

Q. You have never made known then, to the Government, that Sir William Logan told you that Dr. Bell's work was not wholly reliable?—Yes; I have to the Minister.

Q. But there is no record of it?—No.

Q To what Minister?—Sir John Macdonald.

Q. When?—I could not tell you the date.

By the Chairman:

Q. I find the following, in a note attached by Dr. Selwyn, to a report of Dr. Bell, on the Basin of Moose River:—

"It may be, however, that Dr. Rae's recollection of it, as it was forty years ago and Dr. Bell's map of it as it is now, are both correct. A comparatively small elevation of the coast, aided by a silting up of the channel, effected by fluvial and tidal currents and wind, would suffice, in the lapse of forty years, to produce even greater changes in a river delta without any occurrence which could be correctly designated as "a convulsion of nature." Dr. Bell has already shown that there are other reasons for assuming that the shores of Hudson's Bay are slowly rising, or, as he states it, that the water is receding.

"ALFRED R. C. SELWYN.

"OTTAWA, 3rd December, 1883."

This exculpates Dr. Bell. It has also been asserted by an eminent man, connected with the Geological Survey at one time, that Sir William Logan has not had justice done him, and Mr. Thomas Macfarlane, in a paper entitled: "Remarks on Canadian Stratigraphy, says:—

"Although he is gone from us, it is surely our duty to take care that justice is done him, and I contend that it would be only an act of simple justice to his memory to give to the world the results of his labours, just in the shape which they attained at his death. Apart altogether from his theoretical conclusions, the correctness of which Mr. Selwyn disputes, the observations of Sir William and his assistants, as to the actual phenomena exhibited by the rocks of south-eastern Quebec, have a practical value to the country and to all future observers, which I conceive it to be the duty of the Survey to put on record. When we consider the very slender foundation of new material upon which Mr. Selwyn's views regarding the Quebec group are built, it would seem that the conclusions he has arrived at are, to a very large extent, theoretical, and therefore just as little entitle d to immediate acceptance as those of others who have written upon the subject." Are there really reports of Sir William Logan's later years which have not been published, Dr. Selwyn?—No; not one.

Q. This is written by a very eminent man?—Mr. Macfarlane addressed a letter to the Minister on the subject of the Geological Survey, and the matter was referred to Mr. Lindsay Russel, the Surveyor General, and the latter, in his report to the Minister, said: "I would request that copies of this letter should be given to both Professor Selwyn and Mr. Macfarlane." The letter was handed in.

By Mr. Mulock:

Q. He was discredited by Sir William Logan fourteen years ago, you mentioned. Did he write to you?—No; it was verbally.*

Q. How long ago was that?—I really could not tell the exact date.

Q. Was it fourteen years?—I cannot say exactly.

Q. Was it just after Sir William Logan resigned?—I have no precise recollection of the date. It has been mentioned to the Minister, Sir John A. Macdonald, on many occasions. I really could not tell the precise date.

Q. Where has Mr. Whiteaves been doing work?—He is a Naturalist and Palæontologist. His work is almost entirely in connection with the Museum.

Q. How long has he been in the service?—Since the death of Mr. Billings.

Q. How long ago is that?—Several years.

*I find Sir W. E. Logan wrote me two letters on this subject, which I did not recollect when the above reply was given.

Q. What about his efficiency?—He is thoroughly efficient; he has spent his life in connection with the work in which he is engaged.

Q. What about Mr. Hoffman?—His duties are those of Chemist and Mineralogist.

Q. What about his qualifications?—As a chemist, his qualifications are as good as they can be.

Q. For the duties he has to discharge?—He is very painstaking, industrious and hard-working. He is not a first-class mineralogist, but his chemical knowledge enables him to tell what any mineral is.

Q. What are Mr. John Marshall's duties?—He is Secretary and Accountant.

Q. Have you any fault to find with him?—None, whatever.

Q. What about Mr. H. G. Vennor?—He has resigned.

Q. Is Mr. Hugh Fletcher on the staff?—Yes.

Q. What are his duties?—Those of a field geologist, and his work has been confined to Nova Scotia and Cape Breton.

Q. I see his service on the Survey has extended over a period of eleven years and ten months?—Yes; he has only one fault—that he does not exactly understand discipline, like many young Canadians, and last year he was suspended for corresponding with the newspapers about matters connected with the Survey, contrary to regulations.

Q. Has he been an efficient officer?—He is very industrious and hard working, and he works honestly and efficiently.

By the Chairman:

Q. But not amenable to discipline?—I have no other complaint to make of him; he is not what I would call a first-class man, and he does not get a first-class salary.

By Mr. Mulock:

Q. What duties does he perform?—Those of a field geologist.

Q. Do you know where he was trained?—He is a graduate of Toronto University.

Q. And after leaving the University, what has he been doing?—On our Survey; he joined it as assistant to Mr. Robb.

Q. In what department did he graduate?—In Science and Art.

Q. In the Natural Sciences?—I am not quite sure.

Q. Do you know what standing he took?—I do not.

By the Chairman:

Q. How do the salaries at present compare with what they were in Sir William Logan's time?—They are very much larger now than they were then. This, however, only applies to some of the officers, not to all.

Q. Well, with regard to the higher officers, such as immediate assistants?—About the same. For instance, Dr. Hunt got $2,000 a year, or more than that.

Q. What did Mr. Richardson get?—His salary had been gradually increasing every year. He was getting $1,600 when he was superannuated?

Q. Then there is a very eminent and distinguished man whose name will live as long as Canadian Geology is spoken of—Mr. Billings. What was his salary?—$1,800, and I have a memorandum from Sir William Logan, saying that it ought to be increased to $2,000. But Mr. Whiteaves has a far larger amount of work. He is the Palaeontologist, and has the whole care of the Biological section of Museum. The whole work has been greatly enlarged.

Q. But Mr. Billings was the father of Palaeontology in Canada?—I do not think so.

Q. But he was celebrated as a palaeontologist?—So will Mr. Whiteaves be, when he has had more time and opportunity.

By Mr. Holton:

Q. It seems to me that you have a prejudice against young Canadians. In speaking just now of Mr. Fletcher, you said he was not amenable to discipline, like all young Canadians?—I did not say like "all" young Canadians; I said like "many" young Canadians.

Q. Are there not many young Englishmen who are also not amenable to discipline?—Yes; that is a matter of training, but I am dealing just now with young Canadians. There are some of both classes in every country in the world. I did not intend my remarks to apply specially to young Canadians.

By Mr. Mulock:

You say Mr. Fletcher was engaged in Nova Scotia and Cape Breton. Is that during the whole time he has been in the Service?—Yes.

Q. Has no one else in the Service been in the same district?—Mr. Robb was there, and Mr. Fletcher acted as Mr. Robb's assistant until the latter resigned, and since then Mr. Fletcher has been placed in charge. There have been others, among whom I may mention Mr. McOuat.

Q. During the same period?—Yes, but in different sections. Mr. Fletcher was at work in Cape Breton while Mr. McOuat was at Londonderry.

Q. Do all the reports show the name of the officer who made the investigation on which the reports are based?—Yes.

Q. So that, by an examination of the reports you can tell all that Mr. Fletcher has done?—Yes; there is one report which is not published, but which is now in progress. It was handed to me very late last year.

Q. Then you have the getting out of the reports?—I have.

Q. What is the usual custom? Do the men in the field transmit their report or draft of report to Ottawa?—They make their reports in the winter, in the office, when they return, and afterwards hand them to me.

Q. Who would be chargeable with the delay in the issuing of the reports?—The gentleman who makes the report. If they send them in time to be published, before they have to attend to their field duties again, then they are published, but if they come in late, we cannot get through with the publication of them in time to get away to the field. This has been the practice frequently, and now, during the next three months, they will probably be too late to put in the hands of the printer before we go to the field.

Q. Mr. Vennor, I believe, was charged with leaving without having completed his reports. Is there any truth in that?—Yes.

Q. What are the facts of the case?—Simply, as I related them yesterday; he was occupied with weather prophesying and speculating in apatite lands. There are no entries for days together, in his note books.

Q. He was four years behind?—He never sent in a detailed report since 1876, though, as can be seen in the reports, he worked up to 1880.

Q. Where had he been working?—In the Ottawa region.

Q. Is it not the duty of the men out in the field to make an annual report to you?—Yes.

Q. Did he not do so?—No; he gave me a short summary and promised a detailed report.

Q. The first year elapsed, and he promised to do something better; he went into the field the following years, and with what result?—Just the same report—a short summary.

Q. And the third year?—Just the same.

Q. And the fourth year?—There were not four years, I think.

Q. Did you make a complaint to the Government?—Yes.

Q. Officially?—Yes.

By the Chairman:

Q. He was recognized as a very competent man in tracing up these phosphate lands. Did he not do very valuable services in this direction?—Yes.

By Mr. Mulloch:

Q. I see there is a Mr. R. W. Ells on the list. Is he in the service now?—Yes.

Q. What are his duties?—He is a field geologist.

Q. Where is he working?—In New Brunswick and the Province of Quebec.

Q. I see he has been twelve years in the Service. Has he been working there all the time?—No; one year he was in the Saskatchewan District, in the North-West.

Q. What are his qualifications?—Very fair; indeed I may say he is very industrious and efficient.

Q. You have no fault to find with him?—None whatever.

Q. The name of Mr. Scott Barlow is also on the list. What are his duties?—He has taken his fathers place as Chief Draughtsman.

Q. Is Mr. C. W. Willmot in the Service still?—Yes; and he is a very industrious, hard working man.

Q. Is Mr. A. S. Cochrance still in the Service?—Yes.

Q. As Assistant Topographer?—Yes.

Q. He is a minor officer?—As a surveyor and topographyer he would do very well, but he knows very little of geology.

Q. The rest are all minor officers, so that any want of skill on the part of the staff is found in the higher classes and not in the lower?—No; pardon me. I have no complaint to make about Dr. Bell's skill. He is competent.

By the Chairman:

Q. You consider Dr. Bell competent. What, then, is the matter?—That has been already stated.

By Mr. Baker:

Q. In the event of you being ill, or being prevented from attending to your duties from other causes, who would be placed in charge?—I should recommend one of the Assistant Directors, and I should not hesitate for a moment to recommend Dr. George Dawson.

By the Chairman:

Q. Is he not theoretical?—No; he is practical.

Q. He published a somewhat voluminous work some years ago in connection with the boundary survey about the age of certain deposits in the plains east of the Rocky Mountains, entering into a long discussion upon the subject, and giving views of certain geologists of the United States?—I think that was very necessary.

Q. But he arrived at no conclusion?—His evidence was not sufficient to enable him to arrive at a conclusion, but he suggested very many problems.

Q. Which have turned out valuable since?—Yes.

By Mr. Mulock:

Q. I see there are a number of persons appointed since 1882—John Macoun, John Thorburn, A. B. Perry, John McMillan, A. P. Low, H. M. Ami, R. Faribault, R. L. Broadbent, H. P. Brumell, M. O'Farrell and John Meade. All these men appear to have been attached within the last two years, in 1882-83.—Not all. The two last have been many years in the Service; some of them *employed*, though not *appointed*.

Q. So that the Service has not profitted much by their labours?—I have not said so, neither is the supposition correct.

Q. And these men cannot be responsible for any shortcomings prior to the dates of their appointments?—No.

Q Whose places do they fill, or are they new appointments?—A great many of them are new appointments, and most of them since the increase in the means.

By the Chairman:

Q. You have had a large territory to examine?—An enormous extent of country. The whole Dominion.

By Mr. Mulock:

Q. Will you tell me how any shortcomings in the past can be placed individually. You have said that the results are not what you could have wished, because you had not had proper material. Can you specify in what respect your staff, in the past, has been inefficient?—It was principally the want of funds.

Q Not in the inefficiency of the men?—Even the men are not first-class. No man is a first-class man until he has had a great deal of experience. These are all young men, with very little experience. It is a matter of education and training.

Q. Scarcely any of the men have been in the Service twelve years. How, as a whole, have your investigations and reports been verified by practical results?—I do not think they have been disproved in any one single instance.

Q. Did you report in regard to hard coal in the North-West?—That was only a matter of last year.

Q. Did you not four years ago?—Certainly not.

Q. What was your previous opinion?—My opinion was that no hard coal would be found on the plains.

Q. That opinion appears in the reports, does it?—I have no doubt it does.

Q. When did you give that opinion?—Some time in 1881.

By the Chairman:

Q. Is it really hard coal—anthracite coal?—It is a semi-anthracite.

By Mr. Mulock:

Q. Have you had occasion to modify your reports in the least?—Not in the least. I said years ago that there was an abundance of coal in the North-West which all subsequent investigation has proved to be true.

Q. Does any of the staff make any examination of mines working under practical men, and drawing inferences and making reports as to what you have found?—Certainly.

Q. Have you any system for doing that, or is it simply an irregular examination?—It is irregular in this sense, that it is the duty of a field geologist within the district which he has to work, to visit any mines that are being worked, and these reports are included in the section devoted to economic minerals. That was always the custom of Sir William Logan.

Q. Do you not think it would be of service to have a systematic examination of all mining development under practical men? In brief, what is your opinion?—Undoubtedly desirable. Dr. Bell stated that I set my face against the collection of mining statistics, and that I never took any trouble to collect mining statistics. This is untrue and the facts prove it to be so.

Q. Your opinion, as a professional man, is in favour of a thorough examination from time to time, of all the mines that are being worked, and to collect informat on therefrom?—Most certainly.

Q. Why has that not been done?—Because, we had neither means, nor appliances, nor money, and, moreover, it interfered with Provincial action. The larger number of mines in the country were examined and inspected by provincial officers, mainly in Nova Scotia and British Columbia.

Q. If there were no difficulties in the way, then, you would recommend such a course?—Certainly, I would.

By the Chairman:

Q. I think, some two years ago you visited the copper mines at Michipicoten, on Lake Superior?—Yes.

Q. And your report upon that copper mine was rather adverse?—No; it was not adverse. And, moreover, I made no report about it.

Q. At least it read adversely, as I was informed. The people complained that the Director of the Geological Survey, one of the chief officers of the Government, had made an adverse report on the mine, which had prevented their raising the necessary capital in England. They said they had themselves employed scientific and practical men, some of the best miners and mineralogists to be found, and they all encouraged them, saying that it would turn out a profitable and paying mine, and then the Director of the Geological Survey came and threw cold water on the scheme, and the consequence is, that they are now greatly embarrassed in raising capital on account of his report?—The facts of the case are simply these: Mr. Stewart, one of the Directors, came to me, and said he had been up to Michipicoten, and he was interested in a mine there, and would I give him a letter to make use of in London—I was well known in England—as he wished to try and raise capital on the London market. I said to him, "Well, Mr. Stewart, I cannot express any opinion beyond what I know from reading "Sir William Logan's reports, and from seeing the specimens brought from there, "but I have no objection to giving you a letter stating exactly these facts, and point-"ing out that from these facts it appears to be what I would call an exceedingly legi-"timate mining speculation. But if I give you this letter, I wish to ask you not to

"commit the folly of spending the money you get, on the surface, instead of develop-"ing the mine; in putting up great buildings, a great plant of machinery, and all "this kind of thing. If you get the money, the first thing you should do, is to thor-"oughly explore the ground to ascertain how much or how little mineral you can find." "You are quite right," said he, "I will take good care of that," and he went to England, and on the strength of my letter, he gets this capital, and then came out here and went to work. I heard no more about it until the year before last I happened to be up on Lake Superior, so I visited the mine, when I found a magnificent plant of machinery, fine hotel, wharf, steamboat, houses, stores, &c.—in fact, a regular village —and I found three shafts, I think one of them was about 100 feet deep, and no levels nor the ground tested in any way.

Q. Might that not all be necessary ?—I do not think so.

By Mr. Mulock :

Q. Where does the discouragement come in ?—When I left the place, after going through the works, I met the engineer who put up the machinery, Mr. Williams, whom I knew in connection with the copper and gold mines in North Wales, and had a long talk with him about it, and they were at their wit's end to know what to do. At Sault St. Mary I met Mr. Stewart, and I said to him, "I am sorry, Mr. Stewart, to see that you have done the very thing which I asked you not to do." To which he replied, "Well, I know we have, but we had to make some show." I then said: "Very well, I can say no more; it is no business of mine." That is the whole history of my connection with that mine. I certainly think a great deal too much has been spent on the surface, and too little underground, but the whole of my connection with the mine is as above stated.

By Mr. Mulock:

Q. I would like to ask you, Dr. Selwyn, to produce your reports in regard to the coal prospects at or near Medicine Hat. I understand that coal of a certain quasi hard character, has been discovered near that vicinity ?—Near Medicine Hat ?

Q. No, Calgarry; I mean in the Medicine Hat district. Do you know the place I refer to ?—I cannot possibly say without a more definite description, Medicine Hat and Calgarry are 180 miles apart.

Q. You gave an opinion, I am told, in regard to the coal prospects in that vicinity ?—I would like to see it.

Q. Did you make such a report ?—No.

Q. Does it not appear in the reports ?—No; I was at Calgarry last year for the first time.

Q. I do not speak of you personally, but of the survey ?—No; the survey never did either.

Q. Then there never was any report of the coal of the character that has been found ?—That depends upon the locality. The reports made are printed and published and speak for themselves.

By Mr. Cameron:

Q. I notice that there was a geological report of the counties of Inverness, Richmond, Antigonish, and Guysboro', published in 1879, and yet no maps of these counties have been published ?—Some have, and some are in course of publication; they are published separately, here are some of them (witness here handed the maps to Mr. Cameron.)

By the Chairman :

Q. You stated the cost of the survey annually as $83,000 ?—It has varied every year.

Q. That was the estimate for the past year ?—Last year it was only $60,000.

Q. Does that include the salaries of the officers ?—Last year it did.

Q. And it also includes the expenses of the Museum ?—Everything.

HOUSE OF COMMONS, OTTAWA, March 13th, 1884.

The Select Committee on Geological Surveys met this afternoon, Mr. Hall in the Chair.

ALFRED R. C. SELWYN, Esq., F.G.S., F.R.S., LL.D., of Ottawa, Director of the Geological and Natural History Survey of Canada, was called and his examination continued.

By Mr. Holton:

Q. I would ask you, Dr. Selwyn, some questions with reference to those who, since your assumption of the directorate, severed their connection with the Survey, either by resignation or dismissal, so far as you can relate them. I have prepared a list of some eighteen or twenty names, some of whom, however, you have already explained as to the causes of their severing their connection with the Survey. For instance, there is Mr. Henry Brown; what were the reasons for his withdrawal from the Survey?—Before answering the question I may be permitted to say that, while I have no objection to state all the circumstances to the Committee, these statements will involve more or less personal remarks, which, I think, ought not to be made public, as they affect members of the Survey, either beneficially or otherwise, and you can hardly disconnect the beneficial from the injurious. I think this information should be given privately in the office, and not in a public manner. I have not the slightest objection to give the information, but I think that, in view of the manner in which my previous statements have been reported in the public press, that it would be much better to give the information privately.

Q. Of course, referring to public reports, that is one of the misfortunes which we cannot very well control. I do not think we can adjourn to the Museum or to the office of the Survey, and we can only get at the information by investigation here. My object in asking you these questions is to get at some of the causes of complaint. When did Mr. Brown leave?—I cannot remember the exact date, but he left three or four years ago. Mr. Brown joined my survey in Australia, and worked with me for several years. The survey was broken up there, and he and others had nothing to do. He remained in Australia, and some years ago he wrote to me asking me if I could find him a place on the Survey here. Knowing him very well, and knowing that he was industrious and had worked satisfactorily on the Australian Survey, I told him I would do so. He then came here and worked for one or two years, but he found he did not like the climate, and he left again for Australia. Since then the South Australian Government have applied to me for testimonials in regard to him, which I sent them. They have since appointed him Government geologist, at £800 sterling per annum, to make a geological exploration of that colony, and he is now, I believe, doing the work.

Q. Did Mr. Robb resign, or was he dismissed?—He was requested to resign.

Q. Why?—I must object to giving this information publicly.

Q. These gentlemen have been engaged in the public service of the country, and this is a Parliamentary Committee?—Of course, if you compel me, I will have to answer these questions, but I think it is very improper to have them published.

Q. But the public are already aware that Mr. Robb was requested to resign, and there can be no possible harm in knowing the cause?—It becomes a record against these men, I could give the information to the Committee, but if it is to be spread abroad all over the country, I think I must decline to answer unless I am compelled to do so.

By the Chairman:

Q. The Survey has been going on for a great many years, and of course it is publicly known that a large number of the gentlemen connected with the Survey have severed that connection, so that the injury, we may say has been done to them. Of course it is an injury to a man to change his station in life, whatever that position may be. These gentlemen have severed their connection with the Survey and the public has a very proper desire to know what the grounds of complaint are —either for ill-health, incompetency or insubordination. A very brief answer will

serve the purpose of the Committee?—The causes are manifold, and therefore a brief answer does not cover them. Mr. Robb was educated I beleive as a mechanical engineer.

Q. What about Mr. Ford?—He is an Englishman.

Q. What was his department?—He was an artist.

Q. Did he resign?—Yes; last year he asked for leave of absence to go home to England, on account of ill-health, and after he arrived there he wrote to me that he did not intend to come back again, but would seek employment in England.

Q. What about Mr. Mackenzie?—I forget the circumstances of his resignation. My first knowledge of him was also in Australia.

Q. And Mr. Molson?—He was only temporarily employed in the field, and I offered him a position on the Survey, but he would not take it.

Q. What about Mr. Matthew?—He is Deputy-Collector of Customs, and he was employed by Sir William Logan and by myself about two weeks in the year, during the holidays in the summer. He takes an interest in geology, but it was found not to work satisfactorily, as it was difficult to serve two masters, and he has not continued work for the survey during the last year or two.

Q. What about Mr. Broad?—He was allowed to resign on account of using insulting language and insubordation, which I reported to the Minister. He came into my office one morning and told me that I was a liar and that he did not believe a word I said.

Q. When was this?—Last year.

Q. How long had he been in the service?—He was first employed as assistant to Professor Bailey in New Brunswick, and the Professor found him so insubordinate that they were having continual disagreements.

Q. Was Professor Bailey attached to the Survey?—No; he is a professor in the University of Fredericton. And still does occasional work for the Survey.

By Mr. Dawson:

Q. What was Mr. Robb's particular duty when in the Survey?—He was a field geologist; he commenced the Survey of Cape Breton, with Mr. Fletcher as assistant.

By Mr. Holton:

Q. Why did Mr Webster sever his connection with the Survey?—He resigned of his own accord. He was a very hard working and efficient land surveyor.

Q. So that there was no difference of opinion between himself and the heads of the Department?—Not that I am aware of. Mr. Webster was only a land surveyor, which naturally unfitted him for the duties of a geologist.

Q. What about Mr. Ord?—Mr. Ord was exactly in the same position. He had no training as a geologist, but was simply a land surveyor.

Q. And Mr. Tyrell?—He is on the survey, and is both efficient and industrious.

Q. Is Mr. Coste still on the survey?—Yes; he is a graduate of the School of Mines in Paris. He has been on the survey only since last summer, but he is a little hasty in his temper. He has not yet been appointed.

Q. I would like to have you say briefly what, in your opinion, should be considered the necessary qualifications of the Director of this survey and of his immediate assistants. In this I refer to education, training, experience and scientific attainments?—There are a great many degrees and kinds of training. He should certainly have a long experience, especially in conducting similar work.

Q. For instance, early education? Do you consider a University course necessary or essential?—No, not absolutely. A long period of practical training is probably better than a University course. At the University you have simply the theory and not the practice; in fact many of the best men have not had University training. The fact of a man having gone through a University science course, I conceive, would place him in a position in a shorter period than the man who has to attain it by practical work. There are several instances of this on our own survey now. There are those now on the survey who have passed through the science course in the Universities, and who are now getting salaries which they would not have been able otherwise to command for seven or eight years.

Q. People think that the sole qualification necessary in a Director would be a knowledge of geology. Is it not your opinion that a knowledge of other sciences is necessary?—Most certainly it is.

Q. What sciences?—A general knowledge of chemistry, not a special knowledge, and a general knowledge of mineralogy, but geology embraces the whole. Each one of the others is a specialty. The director of the survey should really be a field geologist, because the duties of exploration and the circumstances which a man has to foresee and overcome, necessitate a knowledge of field work, which a mere chemist could not probably do at all. A chemist works in his laboratory, and has nothing to do but office and laboratory work. It is not absolutely necessary that the Director of a geological survey should be a chemist, or a mineralogist, or a naturalist or a palæontologist.

Q. But he should have sufficient knowledge to enable him to direct the specialists?—Yes, but not to interfere with their work any more than they with his. It has been found, however, that the Director of a geological survey should be a field geologist. Sir William Logan was neither a chemist, palæontologist, or naturalist, but he sought to get men on the survey, who had made these branches their special study, and he had to direct them all. The best managers of mines know nothing about mining, but they are business men, and they get specialists to conduct the several branches.

Q. State briefly what is your own scientific training?—My scientific training commenced as an amateur in England in collecting fossils and studying them. I joined the British Survey under Sir Henry De la Beche in 1845. Sir Henry was the best stratigraphist and field geologist that ever lived, and I do not hesitate to say the founder of all accurate geological surveys.

Q. How long were you in the British Service?—I was ten years under him. I did the whole of the maps of North Wales for the British Survey, and I was selected from the British Survey as one of the best men on it to go and take up the work of the geological survey in Australia when gold was discovered there. My work in Great Britain extended over a good many counties, Wales and parts of England.

Q. And then you worked in Australia for 17 years?—Yes.

Q. Your position there was very much the same as it is here?—It was exactly the same as it is here.

Q. Was the work completed when you left Australia?—No, it was not. I am not a universal genius, and those who are ornithologists, botanists, chemists, and mineralogists, &c., &c., are not the best geologists. A shoemaker should stick to his last; my last is stratigraphical geology, and because a man sticks to his last he is not the less qualified to direct others and select others to do their business. All these survey organizations must be made up of specialists.

Q. From Australia you came directly to Canada?—Yes.

Q. And to this day you have been at the head of the survey here?—Yes, and I was requested to come here by Sir William Logan, who was acquainted with my career quite well, and who, as he told me, knew of nobody here whom he considered so fit to take charge of the survey. I accepted the offer, because it was a wider field, and promised to afford a great deal of interesting investigation in the direction in which I have been interested all my life.

Q. What are your duties in connection with the geological survey of Canada?—The duties of directing the survey.

Q. But I would like something specific: For instance, do you do any work in the field?—Yes, every year. I think my reports will show that very clearly. I have travelled over the whole country from Victoria, British Columbia, to Cape Breton doing field work.

Q. Is the whole of your time devoted to the Survey?—Yes, and a great deal more, half the night as well as the day.

Q. What sort of work do you do in Ottawa?—I attend to the direction of the Survey and Museum. I have to read over all the reports, and put many of them into decent English. Here is one, (and the witness here handed a report in manuscript to the

Committee); look at it, and you will see what that involves. I have to revise many of the reports of my subordinates, in that manner.

Q. Is it part of your duty also to arrange work for the different parties going out season after season?—Yes. The gentlemen of the staff are directed by me to go to certain sections, but they have unlimited discretion in engaging assistants. I hold them responsible to carry out the work; they are supposed to know how to do it, and I give them instructions, but I do not bind them specifically, because I know that in this country circumstances arise over which we have no control, and which cannot be foreseen. If they have to depart from the instructions which I give them, they must be guided by circumstances. There may be a certain route designated which is found impracticable, and in that case I must leave it to their discretion to adopt some other route, or other mode of best elucidating the subjects which we wish to investigate, and therefore they are not controlled in that sense in any way.

Q. What instructions do you give them?—Simply to go to a certain district and to investigate the geology and natural resources of that district.

Q. Generally you take one particular section of country?—I have to inspect the work of these gentlemen, and make it correspond in all the different sections. One man will take one view and another a different view, and I have to consult with them and see how far we may make conflicting views correspond. If we cannot arrive at any conclusion, I have to go to the ground and inspect the work myself, and, of course, it is almost impossible for me, in a country such as this, to go everywhere; but so far as I can I devote a certain portion of my time every year to going over the different sections of country, so that I may be enabled to properly direct the subsequent work of my assistants who go to the field.

Q. Is it within your knowledge that any member of the permanent staff of the Survey does outside work and receive fees for it?—It is not within my knowledge. I have suspicions, but I cannot say that it is within my knowledge.

Q. Is there any regulation in the Department prohibiting it?—Most decidedly.

Q. What is the present condition of the Museum?—It is, I believe, getting into a very good condition.

Q. Has it been much improved of late by the addition of specimens?—Yes; but not as much as I could wish. There is no use getting additional specimens until we get additional space for them. I have now a large collection of specimens packed away.

Q. It is the want of additional space, then, which prevents its growth?—Yes; but such as it is, it is in a very efficient condition. The arrangement of it is universally admired, and gentlemen from the United States, Canada and elsewhere, who have visited it have spoken very highly of it. Some have said they intend to adopt my sysem of labelling, as they never saw anything so good.

Q. Is there any record of mining development kept?—In a small degree only. At the end of every report there is a section devoted to economic minerals specially, and every economic mineral known in the district reported on is mentioned there.

Q. Is there any record in the office to which anyone interested can refer?—None, except what there is in the reports.

Q. Or of the mineral resources of the country?—No; but there should be. I endeavoured to do it fourteen years ago, but I was baffled; and for several reasons, which are not necessary to mention, the attempt was continued only in the manner stated.

Q. I suppose you are well acquainted with the United States survey, and its methods of working?—Yes.

Q. What do you think of its mining statistical department?—I think very well of it, and I have no doubt that it is carried on in such a manner as to be most useful.

Q. What do you think of its value to the public?—I think it is of very great value. I do not know the whole of their system. It has been recently organized—I think about three years ago—by Major Powell.

Q. Do you know of any reason why we should not have such a department as that attached to our survey?—Not the least in the world. I recommended it years ago.

By the Chairman:

Q. Will you please give the reasons why the suggestions which you say you made ten years ago have not been carried out?—From the difficulty of getting persons thoroughly competent to do the work, in the first place, and secondly, and perhaps in a still greater degree, the unwillingness of gentlemen engaged in mining pursuits to give us returns of their operations. We had no power to collect them, whereas in the United States they have an Act which makes it compulsory on these gentlemen to give this information. In Canada it is not compulsory. The third reason is that with the exception of the Provinces of Nova Scotia and British Columbia, there was very little mining being done in Canada at the time, and in those two Provinces the Local Government collected the statistics.

By Mr. Holton:

Q. Could this collecting of mining statistics be done by the present staff?—It could be done by one or more persons appointed to do it on the present staff.

Q. Would it require additional expense?—No; I looked forward to Mr. Coste doing this work. I sent him last summer to make an examination of the mineral development of the Lake of the Woods, and he did it very satisfactorily, as far as I can judge. His first connection with the survey was last summer, and the little work that was entrusted to him was done very satisfactorily

By Mr Dawson:

Q. The reports with reference to the Lake of the Woods are not printed yet?—No.

Q. When will it make its appearance?—I am going to get it printed as soon as I get instructions as to who is to print it.

By Mr. Holton:

Q. What is your opinion as to the practical value of what is now being accomplished by this Survey to the people of Canada?—That is a very large question indeed, and I can only say, as the best answer which I can possibly give, is that we are following the experience of all the countries in the world, who have decided that some practical advantage is derived from a Geological Survey of the country.

Q. I estimate that during the last twelve years, this Survey has cost this country between $600,000 and $700,000. This is an enormous sum, and what have we to show for it?—You have the Museum, and the rest of the question can only be answered by referring to the practical experience of similar institutions and their cost in other countries.

By Mr. Dawson:

Q. You have shown us a volume representing reports for 1880 81-82. Does that volume represent to the public at large the value of the Survey, and does it contain the information which the Survey has obtained during those years?—No; certainly not, and in any sense the work which has been done by the Survey during those years.

Q. But what else have they to show for it?—There are other reports. That is only a portion of the work. The removal of the museum from Montreal and its re-arrangement here is a great and a vary large part of the survey work during those years.

Q. But what is before the public at large is contained in this volume?—No, that is only a part of the result of those years. You should not take a single volume, but the reports and maps for the whole twelve years.

Q. But this volume represents three years' work?—No; you cannot possibly put the result of a single season's work into the year. The investigation of a certain amount of country often requires two or three years.

Q. You say there are 4,000 copies of this work struck off. These are, to a certain extent, put in shops for sale?—They are only in the principal bookstores—Dawson's, in Montreal, and Durie's, in Ottawa.

Q. In Toronto, also?—I do not think so.

By Mr. Holton:

Q. On an average, how many are sold?—I could not tell you.

Q. Is there no account kept?—Certainly there is both the gratuitous distribution and the sales are given in the reports.

By Mr. Dawson:

Q. You distribute a lot of them, do you?—Yes; of course if the Government decide that the Geological Survey is no good. It can of course be abolished.

Q. Do you distribute a very large number?—More than are sold.

Q. Do you keep a record?—Yes; I have already answered that question.

By the Chairman:

Q. Does the aggregate of the reports, since you have been connected with the Survey and the Museum, together, represent all the work of the Survey since your connection with it?—Yes; together with the maps and advice and information verbally or in writing to convey one seaking it. There is a good deal to show. We have done an immense amount of work.

Q. The public has to pay for it, and they want to know what they are getting for it?—We make assays for the public; we direct the public where to spend their money and where not to spend it, and to a great extent the Survey acts in the capacity of a mining adviser.

By Mr. Dawson:

Q. Does not the Survey make mistakes sometimes?—Can you point to any mistake which has been made?

Q. They threw cold water on the Lake Superior gold district?—I think I have sufficiently explained that before. The survey never did anything of the kind.

Q. And also said to have thrown cold water on the Chaudière gold district?—That is equally untrue. What are the facts? The first year I came to Canada I went to the Chaudière gold district and examined it carefully. I found Mr. Lockwood at work there—and I gave him after carefully examining the country and the mining that had then been done the benefit of my seventeen years experience in Australian gold fields. He adopted many of my suggestions and worked the mines on these more or less up to 1878—when he again sought my aid, because he said in a letter to me he had spent all the money he had and could not raise any more. I was then in London in connection with the Paris exhibition, and I took a great deal of trouble in this matter and through representation made by me, Mr. Lockwood was able to arrange with Mr. Gordon to carry on the work. Mr. Gordon found all I had told him correct, and is, I believe still working these mines. Strange to say I am now charged with throwing cold water on the Chaudière gold mines, whereas all the capital spent on them by Mr. Gordon and his friend since 1878 was brought into the county through me, and not only without a single cent of profit to myself but at some personal trifling expense—(important evidence given is omitted here).

By Mr. Holton:

Q. I see this last volume covers three years. Why was there this delay in publishing the reports, and why were they not published year after year, as the work was done?—Because it is often impossible to do so, partly arising from the fact of the gentlemen connected with the Survey in sending in their reports. Sometimes I do not get the reports until the time comes round to go into the field, and we cannot sacrifice our short season of field work.

Q. Are some reports of the staff given in full and others not?—Yes, it is simply because some of them can write reports, while others cannot.

Q. Is it your habit to limit the reports of the members of the staff to a certain number of pages?—Certainly not; if the report is spread out unnecessarily, I call attention to it, and tell them not to use six words where two will do.

Q. With reference to Sir William Logan's work: why has his work in the Eastern Townships not been published?—I have no reports of his that have not been published.

Q. Have you no notes, then?—None whatever.

Q. Are there none in the possession of the Survey?—None. There is a map with some geological lines on it, that has not been published, simply because Sir

William Logan asked me himself not to publish it. He went to work to correct it, and he died in the prosecution of that work.

By the Chairman:

Q. Did he not leave some notes of his work during the last two or thee years of his life?—None whatever. I have been over the whole of the work, which in many respects is incorrect, and I have said so in the public reports.

Q. Did not the Department bear a portion of the expense of Sir William Logan, in going over that work before he died?—They simply paid for an assistant to do topographical work—Mr. Webster.

Q. There is no record of that work in existence?—None; except the report that Mr. Webster wrote. I did not publish it *in extenso*; Mr. Webster was not a trained geologist. The plottings of the measurements he made are in the office.

By Mr. Cameron:

Q. In reference to the publication of the reports of Cape Breton, I received a letter from there, dated 19th February, in which the following enquiry is made. "I open my letter to add, with reference to the Geological Survey, for I notice that the promise made that the maps of Cape Breton would be published has not been kept. I see the last Report of Progress, 1880-81-82, has not any reference to Nova Scotia or Cape Breton," and he refers me to a discussion in the Senate in 1882-83, where it was promised that the maps and reports would be published, and they complain not only of one section, but of several sections, that have not been published. I beg to correct the impression, that Mr. Fletcher had anything to do with those complaints, because they came direct from the county?—Last year, Mr. Fletcher actually corresponded with the papers, making complaints to this effect, for which he was reprimanded and temporarily suspended.

Q But still it is none the less the fact that his report is not included in the volume published for 1880-81-82?—That is quite true.

Q. Nor the maps?—They are in the hands of the engraver.

Q. Is it not natural that the people of eastern Nova Scotia would probably impute the neglect to Mr. Fletcher and find fault with him?—They have no right to do so. It is not Mr. Fletchers fault but dilatoriness on the part of the engravers that the maps have not been published. The Messrs. Burland got them last year, and I have not had the proofs yet. As regards the report, Mr. Fletcher put it in my hands very late last spring, and as the maps were not done, I thought it better to defer the report until the maps were ready. The report is in the office now waiting to be printed.

Q. You yourself, in a letter to the Minister of Justice, attached so much importance to those maps made by Mr. Fletcher that you attributed the delay to a desire on your part to have them done in the most perfect manner?—I am not aware that I attached any special importance to these, more than to other maps. I wished them to be done well but never stated that as the cause of the delay.

Q. This letter was written by yourself to Sir Alexander Campbell?—As illustrative of the reports, of course the maps are important, but I do not think you will find any special reference to Mr. Fletcher's in my letter.

Q. They were so important that nobody in this country was able to finish them?—I said that there were no good map engravers here, and I could not get maps published in what I considered first-class style. Mr. Burland himself told me that he did not get enough of this work to get first-class engravers. They employ mostly young men. We draw the maps, and Messrs Burland & Co., of Montreal, engrave them.

Q. There are four mineral counties in eastern Nova Scotia, and there are complaints that they have been neglected?—We cannot do more with the available staff than is done. We have not only Nova Scotia, but the whole Dominion to deal with.

Q. But there is no report for that part of the Survey for four years?—Mr. Fletcher gave me his report of that part of the country early last spring, when it was very nearly time to go to the field.

Q. We can surely expect it in the next report?—Yes.

Q. There is a good deal of fault found with Mr. Fletcher in the East, as they are under the impression that he is to blame?—They have no reason to do so. It is not his fault; he works very industriously, and I have always given him the credit for it.

HOUSE OF COMMONS,
OTTAWA, 14th March, 1884.

The Select Committee on Geological Surveys met this afternoon, Mr. Hall in the Chair.

ALFRED R. C. SELWYN, Esq., F.G.S., F.R.S., LL.D., of Ottawa, Director of the Geological and Natural History Survey of Canada, was called and his examination continued.

By Mr. Dawson:

Q. I see, Dr. Selwyn, that you stated the other day that the cost of the Geological Survey was $83,000 annually?—No, I stated that this current year the total was about $83,000, I spoke from memory but said that the estimates shewed what it was.

Q. It is $92,784, according to the Estimates?—Yes; it has been increasing year after year, and all the members of the Survey that are now put on the civil list get the Statutory increase.

Q. There are four Assistant Directors, three at $1,900, and one at $1,850, making a total of $7,550 for Assistant Directors. Then I see there are five first-class clerks, one at $1,600 and four at $1,450, making $7,400?—They are not first-class clerks; they are field geologists.

Q. Then I see there are five second-class clerks, three at $1,250 and two at $1,150, making $6,050. They are field geologists and not second-class clerks. they are all professional men, and have nothing to do with clerical work.

Q. I see thre are eight third-class clerks, one at $950, one at $900, two at $800, two at $750, one at $600, and one at $550, making $6,100; one Librarian at $600, and messengers, $1,084, I suppose these third-class clerks are junior field geologists?—Yes; some of these young men are from the various colleges.

Q. The Chief Assistant Director is Dr. Dawson?—No; he is not. Dr. Bell has had his name published as Senior Assistant Director, but he had no authority to do so, because they are all on the same footing and were appointed at the same time. The only seniority which he has is the number of years' service.

Q. They do not seem to work very smoothly together, in the Department?—I have no knowledge of anything of the kind, except from these outside letters and reports. I am not aware of anything, except this, that there is intense jealousy on Dr. Bell's part, of Dr. George Dawson. That, I have no hesitation in saying.

Q. Has Dr. Bell been insubordinate?—No; not at all. Dr. Bell accused me of, what he called, sitting on him, when I never did anything of the kind.

Q. As to the value of the Geological Survey to the country: are there not some instances where the opinions of the geologists might have done harm—opinions expressed, which the facts did not bring out. For instance, with reference to the Chaudière gold district, there was an opinion expressed, that the gold there was all derived from a certain class of rocks, which had their limit somewhere about the Plante, and that to the south of true formation; it was all drift or alluvial gold, derived from the destruction or grinding of these older rocks during the glacial period, and as to the rock south of that, it would be useless to look for gold in it?—I doubt whether you can show me any such opinion. I do not remember it, and I have already answered this question.

Q. Opinions of that kind might be very detrimental to the development of the country?—I do not think so at all, if they are correct.

Q. But, if they were not correct?—Then they were simply opinions, and probably given by some person without knowledge of the subject.

Q. These opinions were not correct, I believe?—Well then, why are we asked to give opinions at all. I think correct opinions are very desirable, and I do not

think they are calculated to do harm, if expressed in a proper manner. A great deal depends upon how they are expressed, and by whom.

Q. Last year, I think, an opinion was expressed about the mines of the Lake of the Woods, that the lodes there were rather pinched up?—I never expressed such an opinion. A great many of my opinions have been misrepresented.

Q. What actual mines have been discovered by the Survey?—I do not know if any actual mines have been discovered. It is not the function of a Geological Survey to discover mines, but rather to point out the localities where they may be discovered, and where economic minerals exist. The Survey has pointed out many such, which have led to the opening up of mines, such as apatite, iron, &c. There is scarcely a single mine, except, perhaps, the Jack Fish Lake Mine, the locality of which has not been pointed out before the mine was opened up.

Q. But these mines, with the exception probably of apatite, were all discovered before there was any Geological Survey?—Pardon me.

Q. Was not the coal of the North-West so discovered?—Not until Dr. Hector, of Captain Pallisers expedition mentioned it in his report.

Q. Long before, in Sir John Richardson's time, the great explorer?—You can go back further than Sir John Richardson—by Sir Alexander Mackenzie, long before Sir John Richardson's time.

Q. At that time geologists would not admit that it was true coal?—I have never heard anything of the kind by any geologist of any repute.

Q. Was it not formerly a generally accepted opinion that true coal could not be found in any except in formations of the carboniferous period?—Most certainly.

Q. These coals were of a different geological horizon, are they not?—Certainly.

Q. But do they not sometimes occur where they have no business to be?—No. I find no such theory, after forty years study of geology and of the works of the best geologists in the world.

Q. The lignites belong to the upper Tertiary period, do they not?—Yes, they belong to both the Tertiary period and to other periods.

Q. Coal may then occur in any geoligical horizon?—So far as our experience goes, it points to the fact that it does not appear below the Devonian formations, but then experience is not always infallible; we can only express an opinion according to our experience.

Q. You stated the total issue of the last volume of reports of the Geological Survey at 4,000. Does that include the French?—I think it does.

Q. How many in French?—Five hundred. The issue varies every year: the last one was 500 French and 3,500 English.

Q. I think you stated that these volumes were sold in some of the book-stores?—Yes at Dawson's, in Montreal, and Durie's, in Ottawa.

Q. There are none sold in Toronto?—Not that I am aware of.

Q. How can they get them in British Columbia?—Simply by applying to the publishers.

Q. Are they not advertised?—No; not in the local press. The volume bears the publishers name and imprint, which I think is the usual way.

Q. Many people might not know that. I did not know it until the other day?—A book is always supposed to be on sale by the publisher.

Q. A great many do not know that, with a book like this, costing $92,000 annually—and here are three years' work together—I think it is highly desireable that they should be advertised. There are 4,000 of these published every year, and are only put on sale at Dawson's, in Montreal, and Durie's, in Ottawa?—Mr. Dawson's name appears on the book as the publisher.

By Mr. Holton:

Q. Is any account kept by the Survey of the sales of these books?—Most certainly. Besides those for gratuitous distribution, they are sent to Dawson's and Durie's, and they sell them.

Q. Do they report the number of sold volumes to you?—Yes.

Q. And they pay for them?—Most certainly.

By Mr. Lister:

Q. And supposing they are not all sold?—They return them to me.

Q. Is there any year in which they were not all sold?—I do not remember. A periodical Dr. and Cr. account is rendered.

By Mr. Holton:

Q. Have you no remembrance of any returned books?—I think there was one year. Every book that goes out of the office is entered, so far as I have been able to have it done. No such system was adopted before I came here, but they were given out promiscuously.

Q. Does the Survey fix the price?—We calculate the price according to the cost of paper and printing; in fact, the printer's bill determines the value of each volume, and the return to the Government is that amount, less the bookseller's commission for any he sells.

By Mr. Dawson:

Q. Do you not think it desirable that there should be a larger edition published in a cheaper form, so that the public at large would have the advantage of the information?—I think it is exceedingly desirable. I tried myself to get a larger distribution of both maps and reports. The larger the edition the less the cost per copy.

Q. You do not know the present selling price of these volumes?—I do not.

Q. This volume, the one for 1880-81-82, represents three years, and I think the price is $1.75, is it not?—I cannot remember these figures off-hand. A priced catalogue is published.

By the Chairman:

Q. Here is a large volume of over 800 pages, published by the United States Survey, at 50 cents a volume. Do you not think that something in that form, and made interesting as that is, so that the public could get it at as low a price as that, would be extremely desirable?—Yes; but that is a volume relating to a mineral yield of $450,000,000 value. The total mineral yield of Canada is not much more than as many thousands perhaps.

Q. Is that not a question which we should know?—I have tried to do it, but there are certain difficulties connected with it.

Q. Do you mean to say that, as Director of the Survey, you have not the authority to detail one of your subordinates to take charge of the work of collecting the mineral statistics of the country?—It has been tried and proven for various reasons a failure, and it is a question whether I have the power to do it, and, therefore, I did not attempt it until I got more power and more means. The experiment has not been repeated for want of means and the proper persons to do it. You will find that the gentlemen employed for that work in the United States are experts, not boys from college.

By Mr. Dawson:

Q. Are your present staff composed of boys from college?—Many of them are, and recently appointed.

By Mr. Lister:

Q. The only places where this Report can be got is Ottawa and Montreal. There are none to be sold in British Columbia, New Brunswick, Prince Edward Island, Nova Scotia or Manitoba, or in other parts of Ontario?—None, except at these two places; but I think that it would be desirable that they should be kept in other places. In the meantime, it is sent to every Mechanics' Institute, public library, college or school, and everybody sees the publisher's name, and they can write to the publisher for it.

By Mr. Ferguson:

Q. Would it not be desirable to have agencies established for the sale of these books in the different Provinces?—Yes; I think it would. I have mentioned the matter to the Government.

By Mr. Lister:

Q. How long ago?—I could not say, but it was thought, at the time, not to be expedient.

Q. Nineteen out of every twenty people do not know that there is such a book as this?—I quite agree with you that it would be desirable to publish it more extensively.

By the Chairman:

Q. Do you not think the usefulness of the Survey could be very much enhanced if its attention were turned more strictly to the economic minerals of the country, and to the record of the mining districts, rather than to the strictly scientific work, which the attention of the Survey has been drawn to? Would not that make the volume more interesting?—You start with the assumption that the economic minerals have not been attended to. Such is not the case.

Q. I mean the relative importance that is given to it?—They are studied, and described, and located, and they are collected and placed on exhibition in the Museum. We have actually published a volume, which, I think, it would be desirable to reprint, in connection with the Philandephia and the Paris Expositions; but we cannot do this annually. We have a country 4,000 miles in extent, and our first object is always the economic part of geolgy; the purely scientific part is incidental. It is of the first importance to trace out the geological formations, and, when we have done that, we know where to go to look for certain minerals, which we know to be characteristic of those formations. All I can say is, that the system of this Survey is that of every Survey in the world, but it is not so expensive as many others less than one quarter its size.

Q. But take a practical test. We have before us the volume of the work of the Survey for the last three years?—I think it is not fair to take a single volume.

Q. But this is for three years?—It does not represent the whole work of three years.

Q. It so represents itself?—No.

Q. What does the title page say?—It says it is the report of 1880-81 and 1882, but you must not judge by the reports in any one single volume.

Q. Is it possible in that volume for anyone to discover what is the product of Canada in any one of these minerals?—Certainly not. It is not a volume of mining statistics.

Q. Will you state how many pages are devoted, in that volume, representing, as it professes, the work of three years, to the subject of copper, for instance?—I could not say without referring to it. The subject of copper, so far, is within the limits in which copper is found.

Q. Then the general subject of the copper of the country has received no attention?—Pardon me. It may not have in this volume, perhaps, but it has in other volumes. This is not a volume of mining statistics. I have contemplated such a work but not yet been able to do it. You can see that one year it as attempted. Your whole reference is made to this volume, which happens to be the thinnest of any one year. The object of the date, 1880-81-82, is to try and bring the dates, which have always been behind hand, up, so that they will really represent the date of the work. If you go back to my predecessor's time—he has been held up so very much as an example of useful and zealous work which I might follow—we find that in 1863 a thick volume was published, a special grant being made for doing it, which was the *resumé* of the previous years, from 1844 to 1863. Between 1863 and 1866 not a single report appeared, and in 1866 a volume was published, no thicker than the present one, without illustrations and without maps. From 1856 to 1869 not a single volume was published, and in 1869 a report appeared, in which I took part in getting out and editing it, and since that a report has been published every succeeding year up to the present time.

Q. Were there any great vacancies?—I can only say that that is the true state of the case, and the volume published in 1869 represented the work done in 1866, 1867 and part of 1868.

By Mr. Dawson:

Q. Were not the funds in those years very limited?—Yes; and the area was in proportion to the sum.

By Mr. Ferguson:

Q. There has been a very large sum of money spent in this Survey?—I stated all along that this volume does not represent the expenditure.

Q. Is there no other volume proceeding from the Survey that is available to the public than this, for their information within the last three years?—There are volumes on botany and on palaeontology, and a great number of maps.

By Mr. Dawson:

Q. Are they published?—Some are.

Q. What one?—A catalogue of the plants.

Q. That is Prof. Macoun's work?—Yes; the work of Prof. Macoun.

By Mr. Ferguson:

Q. The object of the Survey is to give information to the public; not only the public of this country, but the public who are invited to this country, which means immigration, and if there is any more information which is not published, is there not a dereliction of duty somewhere, because these volumes should be published at the earliest possible moment?—There are instances of considerable delay. The summer before last, I requested Dr. Bell to examine the Athabaska region, where it is known that salt and petroleum exist, from Sir Alexander Mackenzie's reports of very many years ago, and Sir John Richardson's, too, and more recently, Mr. John Macoun's report, when he was with me examining the Peace River country. I asked Dr. Bell to go there that year, and I expected him to start about the beginning of June, or the end of May, but he did not start until July, and up to this moment I have not got his report.

Q. Could not an epitome of the reports be given in the shape of a small volume for the public use, instead of a large volume of this kind?—I hardly call that a condensation; that is a detailed report.

Q. Something of this kind, and at about the same price (holding up the volume of 800 pages issued by the United States Survey, at 50 cents per copy)?—You are dealing with two different things altogether. I have already stated that a volume of mining statistics is valuable, and should be properly collected, and under a proper law. There is no such law, and no such organization here at present. In the meantime we have done the best that we could, and I can only say that there has not been one single mineral, except the mineral referred to previously, that has not been mentioned by the Survey before it has been discovered, and what we can do more than that, I do not know. Of course, if I have control of the Survey, and I am authorized to pay the members of the staff such salaries as they receive in other countries for doing the work, I can do it, but I cannot do it with young men of no training and no experience.

By the Chairman:

Q. I understand you to say that the collection of mining statistics requires a very competent person?—Certainly. If a man who is not an expert, goes to collect the information, they tell him all sorts of yarns, and he is not capable of judging whether the information is correct or not.

By Mr. Ferguson:

Q. Would it not be advisable to have a practical miner?—No; a practical miner is not an expert.

Q. One may be a theorist and the other practical. He must depend upon the practical miner for knowledge?—There may be such a thing as a theorist, but because a man is a geologist, and an educated man, it does not follow that he is not a practical man. I have seen a great deal of money spent on the reports of the practical miner which was completely thrown away.

By the Chairman:

Q. Have you not seen more reports from the theoretical miner which have proved delusive?—I have never seen money spent on the report of the practical geologist that was thrown away, but I have seen hundreds and thousands of dollars spent on the reports of theoretical geologists, or practical miners, that was thrown away.

By Mr. Dawson:

Q. The reason why you are unable to do such work is the inefficiency of the staff?—I have not an expert in this particular business on the staff; but it is not fair to say that the staff is inefficient. It requires a specialist to do special things, and I have not had the means nor the power to engage them. The best answer I can give to the question is my own report of 1870, because there seems to be an impression that I have no appreciation of mining statistics and economic minerals. I have always attended to it.

By the Chairman:

Q. What attention has your Survey given to studying and publishing the facts regarding the following great mineral industries of the country—coal, salt, petroleum, apatite, copper and iron?—Statistics of all these have been published, although not in the reports of any one year. As regards apatite, I have stated fully the circumstances of my endeavours to get proper reports and maps shewing its distribution. Mr. Vennor was entrusted with that work, and he failed to complete it through causes that were notorious. Last year I commenced the work again, and entrusted it to a gentleman whom I had every reason to suppose was competent to do it successfully. He went out in June or July—and he is well-known in the country as a mining engineer—and I gave him general instructions, telling him that I held him responsible for the work. Wishing to do to others as I would be done by. I told him to select his assistants himself and to take care that he selected good men. Well, he was in the field from July until the 10th of October. He sent me a kind of preliminary report—I might call it a letter—containing, however, very little information, I asked him to fix the position where apatite was to be found on the map correctly, so that any one would with the aid of the map know where to look for it. In this report he mentioned a line he had run, and it had taken him six weeks to run this line. I asked him how many miles this was, and he said it was four miles. Any one of the members of the Committee will easily see that it was getting along very slowly to only run a line of four miles in six weeks. I said to him: "If you cannot do better work than this, it is no use your beginning it, because you will only be spending money and will not succeed." He replied that they had to cut the line out and go all over the work again. "Were you not there to superintend the work?" I asked, to which he answered that he had to go away about something. Now that gentleman has promised me a report, but I have never received it. He has been working at it since he came in on the 10th of October. That is another case where I suppose I have been accused of treating a member of the staff unfairly, but I will ask Mr. Dawson, who understands this work, if he could not run a line of a great deal more than four miles in six weeks.

Mr. DAWSON—It is certainly very little work for that length of time.

By Mr. Holton:

Q. At one of the early Committee meetings you charged, by implication, at least, a prominent member of your staff (Dr. Bell) with inaccuracy in his work and reports, and further declared that, as a consequence of this, he was unreliable and his work unsatisfactory, and this assertion you based upon information and a corrected map of the neighbourhood of Moose Factory, which you said you had received from Dr. Rae, of England. You also stated that you had so informed the Minister, and that you had further, in a note placed opposite this map in your last official report of the Survey, made a similar statement. I, therefore, have to request that you place in the hands of this Committee the whole of the correspondence which you have had with Dr. Rae or others upon this subject, and also the corrected map furnished you by him, and also to state what other steps have been taken by you to make out a case of inaccuracy against Dr. Bell?—I have taken no steps to make out a case of inaccuracy against Dr. Bell. I never stated that he was inaccurate; I simply called attention to the fact, as I consider it my bounden duty to do, but I never asserted to anyone that Dr. Bell was inaccurate. There is a great difference between charging a man with inaccuracy, of your own knowledge, and calling attention to others having so charged him, and the two should certainly not be confounded. The one I did,

but the other I never did, and not only that, but I have tried to point out how Dr. Bell might be right and Dr. Rae mistaken.

QUESTIONS *submitted to Thomas Macfarlane, Chemist,* 16 *Inspector Street, Montreal, and replies thereto—submitted to the Select Committee appointed to ascertain the methods adopted by the Geological Departments of this and other countries, &c* :—

Have you had any opportunity of noticing the organization of the Geological Survey of Canada and its methods of working?—Yes; in 1865-66 I was employed on the Survey under Sir W. E. Logan, exploring and reporting on the shores of Lake Superior, and the County of Hasting, Ontario, and both then and since have been much interested in the geology of the country.

Have you any knowledge as to the manner in which geological surveys are carried on in other countries?—Yes; while engaged professionally in Norway, Saxony, and the United States, I have had occasion to observe the work done by the Geological Surveys of those countries.

In what capacity were you engaged professionally in these countries?—As Chemist at the Modum Cobalt Works and Kuterna Mines in Norway, in 1855 and 1856; as manager of the same from autumn 1857 till autumn 1859; as manager of the Amandal Copper Mines, Hielemarken, Norway, till autumn 1861; as manager of the Wyandotte Silver Smelting Works in Michigan, in 1871, 1877 and 1878; as metallurgist in Leadville, Colorado, in 1880, and as expert in reporting on mines in Colorado, Utah, Nevada and South America.

Have you had any experience in mining or smelting in the Dominion?—Yes; at the Acton Copper Mine, from 1861 to 1864; at the Albert Copper Mine, Ascot Township, P.Q., from 1866 till 1868; at the copper mines of Capelton, P.Q., from 1873 till 1876, and in the Marmora gold district in 1879.

Have you had any experience in exploring, beyond that gained while on the Geological Survey of Canada?—Yes; in 1868, 1869 and 1870 I was employed exploring the mineral lands of the Montreal Mining Company on Lakes Huron and Superior, when the Silver Islet Mine was discovered.

What do you conceive to have been the object of the Government in establishing the Geological Survey of Canada?—When I came to Canada in 1860, and conversed with Sir W. E. Logan on the subject, his opinion seemed to be that the chief work of the Survey was to assist in discovering and developing the mineral resources of the country, by all the scientific means at its command, and in a subsidiary manner only collecting and studying scientific data. In 1877 an Act was passed by the Dominion Parliament "to make better provision regarding the Geological and National History Survey of Canada, and for the maintenance of the Museum in connection therewith." Section 2 of this Act says: "The objects and purposes of the Survey and Museum shall be to elucidate the geology and mineralogy of the Dominion and to make a full and scientific examination of the various strata, soils, ores, coals, oils and mineral waters, and of its recent fauna and flora, so as to afford to the mining metallurgical and other interests of the country correct and full information as to its character and resources." This definition of the object of the Survey does not differ materially from that entertained by Sir W. E. Logan nor from those prevailing among the public generally.

How long has the Survey been in existence?—Since 1842, I believe; consequently, forty-two years.

How long was it under the directorship of Sir W. E. Logan?—From 1842 until 1869, when Dr. Selwyn succeeded him.

Have you any idea of its cost to the country, from 1842 till now?—I do not suppose that that could have been less than $1,500,000.

Do you think that the results have been worth the cost to the country?—I very much doubt it.

Do you think that the Survey has been useful in fulfilling the object of its existence?—There is no doubt that it has been of great service to the country, but I do not think that of late it has been quite as useful as formerly, or as it is capable of being.

In what respect has it been defective latterly?—In spreading its energies over too much ground, and failing to work out any district thoroughly; in discussing matters of theoretical geology rather than in collecting reliable facts, and in quite neglecting those to be obtained by a close inspection of our mines and a recording of the work done in them.

Was there more attention paid to mining by the Survey when it was under the direction of Sir W. E. Logan?—I think so. The reports of the Survey, previous to and including the General Report of 1863, show that no inconsiderable amount of work was devoted to the mining interests of the country.

What results has the Survey to show for the money expended upon it during the last forty years?—The maps and reports which it has published, and the various collections now exhibited in the Museum.

Do you not think that it has had some influence in encouraging sound mining enterprise, and in discouraging useless searching for economic minerals, or speculation in mines and mining lands?—I do not think that it has had much influence in any of these directions, unless, perhaps, in preventing boring for coal in Quebec and Ontario.

What maps have been published by the Survey?—The only one published separately from the Reports is that of 1864, which embraces Newfoundland, the Dominion (exclusive of the North-West) and a large part of the United States.

Is not this map, in your opinion, valuable and instructive?—It is quite valuable, as showing the views entertained by the late Sir W. E. Logan regarding the geological structure of the country; but it can scarcely be regarded as useful or instructive, even to the better educated part of our population.

Why should not people of good education be able to make use of it?—Because its colours indicate formations and not the rocks, or the groups of rocks, actually found at the different localities shown on the map. There can be no doubt as to the rocks which actually crop out at the various points, but the opinions of different scientific men vary immensely as regards the formations to which they belong. The map, therefore, only shows Sir William Logan's views as regards the distribution and constitution of these formations.

Do you not believe his views on such points to have been correct?—Not always. For instance, as far back as 1862, I maintained that the rocks of the Quebec group were more ancient than the Potsdam sandstone, which view has since been adopted by Drs. Hunt and Selwyn, although it is not yet admitted by Professor Dana, Principal Dawson, and many of the Survey officers.

Is it always possible to show on a map the actual distribution of the rocks or rock groups?—Not always; and it is, of course, most difficult with maps on such a small scale as that of 1864. Sir William's declared intention was, however, to cause it to be followed by other maps of greater minuteness.

Where do you find any intimation of such an intention?—In the Atlas published in 1863, where we find the following statement (p. 23).: "It is now the intention of the Geological Survey to publish in successive portions a geological map of the Province of Canada on a scale of 4 miles to an inch. Such a map of the Canadian territory south of the St. Lawrence, from a meridian somewhat east of Quebec to another a little west of Montreal, is now prepared and already partly engraved. Another similar map including the region to the west of the last, as far as the meridian of Bowmanville, and extending northward nearly to the 48th parallel of latitude, is in preparation, and it is proposed that these shall, in due time, be followed by similar maps of other portions of the Province."

Have any of the maps thus promised been published?—No. Two private editions of the Eastern Townships map have been published, and these are justly valued for their correct topography, but the geological edition, with the colours indicating the characters of the rock exposures, has been published by the present Direc-

tor of the Survey. As for the map of Eastern Ontario, no work seems to have been done on it since Sir W. E. Logan's death, in 1875.

What reasons has Dr. Selwyn given for not publishing the geological map of the Eastern Townships?—Dr. Selwyn maintains that Sir William's views on the age and structure of the Quebec group of rocks are incorrect. He came to this conclusion very shortly after Sir William's death, but nine years have since passed and still the map is unpublished.

Do you think its publication would be of public advantage?—Yes; provided it were not caused to represent mere theories regarding formations, but only the facts ascertained by the officers of the Survey as regards the nature and position of the various rocks, or groups of rocks, to be observed in the townships.

Are we to understand that the Survey has published no maps since Sir W. E. Logan's death?—No general or separate maps have been published, but many smaller maps, illustrating special explorations by officers of the Survey, are contained in the Reports.

Do you consider these to be valuable?—Some of them certainly are; for instance, I have found Mr. Vennor's map of the townships in Hastings County very useful.

Have you not found the reports themselves to contain valuable information?—Twelve volumes of reports have been published since 1863, containing a great deal of varied information, some of it quite valuable, but comparatively little of it referring to our mineral resources.

State some of the defects in these Reports?—I will only mention the last one for 1880, 1881 and 1882. It is only half the usual size, and contains the work of only a small portion of the staff. The page of errata shows great carelessness in the line of reading. Mr. Vennor's work of four seasons, from 1877 to 1880 inclusive, is not furnished, although it would be of great interest to all who are engaged in developing the phosphate industry. The notes on Quebec mines make no mention whatever of those of Capelton, which have been supplying several chemical and copper works near New York, with large quantities of ore. The statement that the bulk of the ore of the Suffield mine resembles that described by Dr. Harrington as tetrahedvite, is surely incorrect and misleading. The description of the Jackson Rae apatite mine is quite inaccurate. The chemical contributions from the Laboratory of the Survey seem very trifling, when it is considered that they are the results of the labours of the chemist and his assistant for three years.

Are you aware of any reason for this neglect of the mines of the country by the authorities of the Survey?—I believe it is because the present director is of opinion that we have no mines which are not sufficiently cared for by the Provincial Governments, and that with regard to economic minerals the Survey has chiefly to do with those occurring on the Crown lands of the Dominion.

Do you think this opinion is well founded?—No; for after a mining location or claim has been granted, the Provincial Government exercises little or no control over the resulting mines, and makes not the slightest attempt to recover any facts of technical or scientific interest in connection with them. Nova Scotia is, perhaps, an exception, for there the payment of a royalty on gold to the Local Government makes it necessary to have a Department of Mines.

Do you think it would be advisable for each of the Provincial Governments to establish a Mining Bureau for recording mining statistics, obtaining plans of underground workings and elucidating scientific facts observed in the exploration of mines?—No; for a staff of officials containing all the practical and scientific talent necessary for doing this, and the necessary accommodation and apparatus for them would be too expensive for each Province, and it is doubtful whether they could find continuous employment on the mines of each individual Province.

Do your consider that the present staff of the Geological Survey is sufficiently numerous to watch the development of the mines of the whole Dominion?—I do.

Do you think that the Survey has heretofore given judicious advice to the public as regards mining?—I thing most people who have had dealings with the Survey

have noticed an extreme cautiousness and indefiniteness on its part in giving advice, which amounted to a general discouragement of all mining enterprise. Reasonable cautiousness and circumspection are of course highly commendable, but indiscriminating advice to have nothing to do with mining, simply has the effect of making that industry disreputable. On the other hand, the Survey has occasionally thrown aside all caution and become entangled in schemes which have brought discredit upon mining and the country. If, instead of thus oscillating between two extremes, the Survey had settled down to its proper work, giving careful and minute descriptions of the mineral occurrences and mines, accompanied by plans and sections, with estimates of cost, &c., and judiciously distinguished between these schemes which could not by any possibility pay and those which gave reasonable promise of doing so, there would not now prevail so much want of confidence in it on the part of those interested in mining.

Has the failure of the Survey to do such work had any bad results?—The want of minute and reliable information regarding mines which have been worked and abandoned has occasioned much loss of capital. Representations on the part of interested parties have caused worthless mines to be repeatedly unwatered and manned, only to result in repeated failure. If, in such cases, the archives of the Survey had contained plans and dates concerning the previous working of these mines, such disastrous losses might very likely have been avoided.

Do you think that the records of the Survey are defective as regards mines now in operation?—Yes; for instance, in the cases of the Silver Islet Mine, Lake Superior. This mine was discovered by an exploring party, under my direction, in 1868, and in February, 1870, I published a description of it, directing attention to its extremely rich ore, and to an apparently new mineral occurring in it. Although the mine has since been worked to a depth of 1,000 feet, and ore to the value of over $3,000,000 produced, no study of its phenomena has been undertaken by the Survey, consequently, nothing has been ascertained of such a nature as to guide the labours of the explorers in the same region. Neither has any survey been made of the underground workings by geological authorities, nor was any chemical examination made as regards the nature of the supposed new minerals, until Professor Henry Wurtz communicated to the New York Academy of Sciences, in 1870, a description of two new mineral species found at Silver Islet, which he termed huntilite and anmitite. The honour of discovering these new minerals might easily have been earned by Canadians, had the Geological Survey properly performed its duties. There is also a great deal of mining now being done for gold and silver in the County of Hastings, of which no notice is taken or record kept by the Survey.

Do you consider it part of the work of the Survey to employ a staff in making discoveries of useful minerals?—No; that properly belongs to private enterprise, but the Survey authorities ought to be able to indicate the districts throughout the country in which remunerative mines might reasonably be sought for.

Has this not been done?—I think not; for instance, the most wonderful copper mine in the world, the Heckla and Calumet, producing 15,000 tons of ingot copper annually, is worked on the south side of Lake Superior, but our Survey does not point out with sufficient accuracy where such mines may reasonably be expected, on the north shore of the Lake. The same remark applies to the iron mines of Marquette. Nor has the Survey ever indicated in advance the districts which were likely to become productive in phostphate, gold or silver.

Has not the Survey been useful in advising and guiding individual explorers?—Not to any great extent. The Survey has never even undertaken to do assays or analyses for explorers or the owners of mines, who are thus left in uncertainty as regards the value of their ores. This is especially felt by the proprietors of phosphate mines. There is no good reason why such work should not be done for the public, and paid for at reasonable rates.

Does this indicate to you a want of proper management?—Yes; and of proper system and organization. With the exception of the Director, Palæontologist and Chemist, none of the officers of the Survey have any very definite positions or work

assigned to them. Even the position of the Chemist and Mineralogist is singular, seeing that he is, nominally, at least, Inspector of Mines. The Palæontologist is also styled Assist nt Director, an honor which he shares with two other gentlemen on the staff. None of the officers are charged with doing the underground surveying of mines, or the collection of statistics, although several of them are quite competent to do so. No practical metallurgist, or ore-dresser is employed on the staff, although under Sir W. E. Logan this was differently arranged.

How does the work of our Survey compare with that of other countries?—No other country in the world has been at so much expense in supporting a Geological Survey as Canada, and carried it on for such a long time. Nevertheless, the results cannot compare with those gained in other countries in much shorter periods. As models of excellence the work and publications may be mentioned of the United States geological exploration of the 40th parallel.

Are you aware as to what has been done in other countries for the encouraging of mining and the collection of mining statistics?—With regard to England, I understand that in 1843 Robert Hunt originated the system of collecting returns of the produce of collieries and metalliferous mines, the returns to be purely voluntary. In 1848 the first volume of statistics was published, and they were regularly continued each year until 1881. Under the Mines Regulation Act, it became compulsory for the colliers and mine owners to furnish annual returns to the Inspectors of Mines, which were published in aggregate in the Inspectors reports. They have not represented the total production of the United Kingdom, since the Inspectors had no power to obtain returns from any other workings. Consequently, the production of tin and iron (as given by the Inspectors) and some other minerals, fell far short of the truth. Two years ago the Treasury awakened to the fact that two Departments were doing the same work, and that mineral statistics were published in duplicate. After long consideration it was determined that the Mining Record Office, established by Mr. Hunt, should be abolished, and the business of obtaining returns from the mines should become part of the duty of the Inspectors of Mines, under the direction of the Home Office. This arrangement has been carried out, and the work which has been hitherto done by Mr. Hunt, under a strictly voluntary system, is now to be carried out with the power of an Act of Parliament, and twenty-six Mine Inspectors. The statistice for 1882 are not published yet, but they have been compiled and are in the hands of the printers. The volumes from 1843 to 1881 are probably to be found in the Parliamentary Library. Mr. Hunt had his office at the Museum of Practical Geology in Jermyn Street, London, and it appears to have had some connection with the Geological Survey of Great Britain.

In France, the collection of mining statistics is entirely in the hands of the inspectors of mines, and, indeed, those officers also form the staff of the Geological Survey.

I can give full particulars regarding the system pursued in Saxony and Norway, but the circumstances of these countries are so different from Canada, that it appears useless to go into details.

In the United States, the Geological Survey, now under the directorship of the Hon. J. W. Powell, has a special "Division of Mining Statistics and Technology," under the charge of Albert Williams, jun. This gentleman has recently published a report, called "The Mineral Resources of the United States," for the year 1882 and first six months of 1883, a work exceedingly valuable, not only for its statistics, but for its technology. As in Canada, the United States Geological Survey is placed under the Department of the Interior, which is also charged with the work of the Census. It has published a report on the production of the precious metals in the United States, during the tenth Census year, between the 1st of June, 1879, and 31st May, 1880, which shows the large amount of work done in collecting statistics, principally by the staff of the United States Geological Survey. Compilation of statistics is, however, far from being the principal work of the Survey members. They are very largely occupied in exploring and studying the geological relations of important mining districts, mapping out the areas of productive rock, ascertaining

the conditions which regulate the distribution of the economic minerals, examining the processes for the most economical and satisfactory treatment of the ores, and pointing out the possibility of improvement. As an example of the excellent way in which this is done, I refer to Emerson's Report on the Geology and Mining Industry of Leadville, Colorado. Having been myself engaged smelting ores in Leadville, I happen to know the great value of this Report. From this it will be seen that the United States Geological Survey gives the fullest details as to statistical, scientific, and technical matters connected with the different mining districts, not only in the Territories, but also in the individual States.

In what way do you think the Canadian Survey could be rendered more useful? —By being reorganized and more efficiently directed towards both practical and scientific work; by giving each member of the staff a well defined sphere of labour, and encouraging him at the same time to co-operate harmoniously with his colleagues?

What number of officers do you consider necessary, and what would be their respective positions?—1 Director; 2 to 5 Field Geologists; 6 Palaeontologists; 7 Botanists; 8 Chemists and Assayers; 9 Mineralogists and Lithologists; 10 Surveyors of Mines and Records of mining statistics; 11 Metallurgists and Technologists; 12 Lapidaries. The names sufficiently indicate the duties, but the distribution of these might be modified according to the qualifications of the several officers.

Do you not think that some Surveyors would also be necessary?—The field geologists are of course surveyors, but a large amount of work of this description might be dispensed with if advantages were taken of the work of the numerous and efficient Provincial and Dominion Surveyors, and of the maps on record in the various Crown Lands Departments.

In the event of its being impossible to carry on an elaborate Geological Survey, what would you suggest in its place?—The establishment of a Mining Record Office similar to that organized by Mr. Robert Hunt in 1843. It should not, however, be purely statistical, but be in charge of men capable of surveying each mining district of importance, and minutely describing its characteristic mines. In this way lithological maps might be prepared, and descriptions published of the following more important mining districts of the Dominion:—

I.—Township of Ascot and its copper mines.
II.—Megantic County and its asbestos workings.
III.—County of Ottawa and its phosphate workings.
IV.—County of Hastings and it gold and iron mines.
V.—Western Algoma and its silver mines.
VI.—The coal regions of the North-West.

Should no reform of the survey be possible, what course would you advise?—Its entire abolition, because at present it is almost useless to the country.

What would then be done with the various collections now in the Museum?—They might be placed under the care of the Royal Society of Canada, and the Survey building used as its head quarters.

If it were decided thoroughly to reorganise and reform the survey, do you think that it could then be made of service to the country?—I think that it would be useful in the highest degree for developing the mineral resources of Canada, and causing these to better appreciated in foreign countries, besides, as in former times, procuring a high reputation for Canada from the scientific work incidentally performed by the Survey officers.

THOMAS MACFARLANE.

HOUSE OF COMMONS, OTTAWA, 15th March, 1884.

The Select Committee on Geological Surveys met this morning, Mr. Hall in the Chair.

George M. Dawson, Esq., D.S, A.R.S.M., F.G.S., of Ottawa, Assistant Director of the Geological and Natural History Survey of Canada, was called and examined.

By the Chairman:

Q. How long have you been connected with the Survey?—Since the spring of 1875. Before that time I was connected with the British North American Boundary Commission from the spring of 1873, which was the first connection I had with Government work. Half the expenses of that Commission were paid by the Canadian and half by the Imperial Governments, and it was appointed for the purpose of determining the boundary from the north-west angle of the Lake of the Woods to the Rocky Mountains. Capt. Cameron was the Commissioner in charge on the British side, and in that work I was engaged two whole seasons as geologist and naturalist to the Commission.

Q. How long have you held your present position as Assistant Director?—I fear I cannot tell the exact date from memory. Four assistant directors, of whom I was one, were appointed simultaneously.

Q. Will you please explain to the Committee what you understand to be the functions of the Director, as distinguished from that of the Assistant Directors or other members of the staff?—The functions of the Director, I think, might be classed under two heads: First, those that are of a purely routine and official character in connection with the management of the Department as a whole, the control of its expenditure and the distribution between the various fields of work, of the grant, and second, the strictly scientific duties of supervising the work done in the various departments, judging of its character and seeing that it is put in proper shape and properly published. I may also state that the duties of the Director of a staff like ours are onerous, considering what he has to do, both in occasionally assisting in field work (particularly in elucidating points about which there is a difference of opinion among those engaged in the work), and also having charge of the expenditure and looking after the publication of reports and duties of that kind.

Q, What are his authority and responsibility in relation to the Assistant Directors and other members of the staff? Has he the entire control with reference to the nominations to those positions and to the direction of the Assistant Directors in their positions?—Not quite. Of course, since we have been included in the inside branch of the Civil Service, appointments to the staff are made by Order in Council, and though the Director naturally nominates them, the appointment can only be made by Order in Council.

Q. Is that limited to the assistants, or does it also extend to the other officers of the Survey?—It extends to all those on the permanent staff.

Q. So that the Director has really no appointment in his own power? I suppose that would carry with it the conclusion that he has no power to discharge either?—As I understand it that is quite correct, except in the case of temporary appointments, and I think the general regulation is that a temporary appointment cannot continue longer than three months. If an incompetent man is once attached to the staff by Order in Council it may be a difficult thing to get rid of him.

Q. What would be his duties, responsibilities and authorities in so far as directing the work of the Assistant Directors? Has he entire control over that?—Practically entire control, although I know it has been the practice to submit a scheme of work for each, for the year, to the Minister for his approval, and in any case where it has been desirable to explore particular tracts, the Director is requested to take immediate control himself or some of his assistants. For instance, with regard to the Peace River, in 1879. At that time it was thought that a railway route would be chosen by the Peace River, and Dr. Selwyn was requested to send a party in connection with the surveys there, and I was sent on that duty to work in connection with the engineering parties for one summer.

Q. The Assistant Directors, I suppose, do not work conjointly in carrying out any field work, but a separate section of country is assigned to each for his summer's work?—Yes; I should explain perhaps, that there are now four Assistant Directors, but only two of those, Dr. Bell and myself, have been engaged continually in field work, Mr. Whiteaves and Mr. Hoffman are almost permanently attached to the Museum—Mr. Whiteaves as Paleontologist and Mr. Hoffman as Chemist—and they have only visited localities interesting from chemical and paleontological points of view.

Q. Your work and that of Dr. Bell, then, consists of field work during the summer, and to return to Ottawa to complete your report during the winter?—Exactly. I may also state, perhaps, that, as a rule, the winter is scarcely long enough to get the summer's field work into proper shape, because, what between writing the report, and getting the maps constructed and engraved, and the report printed, it very often happens that the work cannot be got through the press under the supervision of the writer of the report, until the second winter.

Q. To what are these delays attributable?—Of course it takes some time to prepare a report in proper shape, and to elaborate sufficiently the different features of the work. In the printing of the report and maps, the supervision of the writer is necessary, as very often little questions come up which cannot be decided without him, and if the writer has gone into the field, the report will have to stand over until the ensuing autumn.

Q. Is there no record of the work of the summer accessible to the public in any form, until it is actually published in the Report?—There is a short outline of the season's work sent in by the Director to the Minister of the Interior, and incorporated in his Departmental Report every year, being sent in just in time to form part of the Report presented to Parliament. There is no detailed account of the work printed until the Official Report is issued. But, as a rule, if gentlemen interested in any mine or other subject in any part of the country, ask for information, we can give it, and of course we do so very freely, by letter or otherwise.

Q. Can members of the Geological Survey give information to the public, by correspondence or otherwise, separate from the reports, and in advance of them?—Yes, so far as not to interfere with any individual rights. It would not be right, as a rule, to give a report of a given mine, which might be favourable or adverse to it, but in regard to general questions, such as the number of seams and their depth at a given point, we are very happy to give all the information we can.

Q. As a matter of fact, is there much enquiry?—In my own field there has been a good deal of enquiry.

Q. That is the coal fields of the North-West?—Yes; the coal fields of the North-West and the mines and minerals generally of British Columbia.

Q. Although you had no direct personal connection with the Survey under Sir William Logan, yet of course, you are familiar with its history under his charge?—Yes.

Q. Would you state to the Committee your impressions as to the efficiency of the Survey under the present system and administration, as compared with its corresponding efficiency under that of Sir William Logan?—As far as I know the system of administration is very much the same at present as under Sir William Logan, only more expanded in connection with the larger scope of territory and the larger amount of money that is at its disposal. There is one point, however, which perhaps I may be excused for touching on. I think that the Survey should as far as possible be removed from all political influence, and that is one thing which was perhaps better in Sir William Logan's time. We were in Montreal, and under charge of Sir William Logan, and the very fact that he assisted the Survey with his own means gave him such a feeling of independence that he was very determined in preventing any aggression. I think in a department of this kind, of which the public cannot properly understand the work, work which requires a great deal of original thought and even enthusiasm to carry it out, the responsible head should be made independent of any outside influence, I think the members of the Committee will

understand that in any other case the tendency will be among the least useful members of the staff to work other methods of interest than those of doing their work. It seems to me that in a department of this kind, if the Government has confidence in its head, they should give him the utmost possible power, if not then they should not have confided the management to him. It should be the same with every scientific department. I saw that a gentleman giving evidence in the Agricultural Committee the other day, said an agricultural station would be a success, if it was altogether put apart from political influence, which might be detrimental to it.

Q. You feel then that for the efficiency of the Department, increased authority should be given to the Director. I suppose it would be a conclusion from that, that the selection of the Director would then be a matter of much more importance; that is, his personal fitness for the place would become a matter of much more importance if his responsibilities were increased ?—Certainly.

Q. You have given your views generally in comparing the Survey and its administration now with that of Sir Willian Logan. I would be glad to have your views, so far as you are able and willing to give them, as to its reputation for efficiency and ability throughout the world, through Great Britain, the European countries and the United States. How does it compare at present, so far as its reputation goes with its administration under Sir William Logan. Does it occupy the same relative position as regards efficiency ?—I think so. I have no knowledge of anything to the contrary. I have a pretty extensive acquaintance with the scientific men of the United Siates and Europe, and I have always heard the Survey spoken of in the highest terms. Of course,in Sir William Logan's time, the country was geologically quite unknown, and there were striking geological facts to be discovered, which were likely to attract the attention of scientific men abroad at the time. Afterwards the work assumed more of a routine character. Apart from that, I do not know any difference ; in fact, I have only heard it spoken of abroad in the highest terms, In Canada, unfortunately, we can only point to two scientific branches—the geological and the meteorological—supported by the Government. In almost every other country, you find botanical gardens, &c. One case in which its utility was particularly established, was the display of the products of Canada at the various exhibitions in London, in Paris, and in Philadelphia, and in all those cases, I may say it received the highest commendation for the manner in which the products of the country were displayed and the prominence given to them. Some of these were under Sir William Logan's care, and the two last were under the care of the present Director.

Q. You dropped the remark that the present system was very nearly identical with that of Sir William Logan. Is it not a fact that the condition of the country in its mineral development has very much changed during the last thirty years ? At that time they were not developing mines, only superficially in some cases, but not to a very great extent, and now there is a large mineral output throughout the Dominion. There was nothing to correspond with it at that time. I would be glad to get your opinion as to whether the change with the country in that respect ought not to have made a change correspondingly in the Department ?—I meant rather that the method of administration was the same, as a whole, than that the mode, character and extent of the researches were the same. Of course, the mining industry, as you remarked, has very much developed since then, and the operations of the Survey have been extended over a much larger tract of North America, and these surveys of an exploratory and preliminary character which have been superseded in the Eastern Provinces are now going on in the west, while in the portion of the east in which something like decent maps can be got, and which owing to its settled condition is important, there is a detailed system of investigation which there was not in Sir William Logan's time. We have very nearly completed a geological map of New Brunswick on a scale of four miles to the inch, and those of Nova Scotia and Quebec, on the same plan, are in progress. In the west, of course, a system of running surveys has to be adopted of a more or less fragmentary character, because

of the necessity of knowing, in a general way, its resources in coal and other minerals upon which the settlers must depend immediately.

Q. I would be glad of a little more definite answer, expressing your views upon that subject, with reference to the mineral development of the country. The impression of the Committee is, that the work of the Survey, as indicated by the reports, does not show very much attention to mineral observations. We would like to know whether the Survey are attempting to collect these statistics or whether that is left entirely to private enterprise?—I may refer to this little report of mine in the last volume which has been issued and which, on account of its small size, might be thought to represent very little work. The report covers twenty-three pages, and represents one year's work of myself and assistant, and a second year's work by my assistant alone, besides additional observations by myself, in the Bow and Belly River District, covering an area of 24,000 square miles, and involving measurements of 3,000 or 4,000 miles. This report which, although it contains only twenty pages, includes much valuable information in regard to coal deposits. It is not fair to judge by the mere size of the report as to its value. It was issued in this condensed form, because there was great interest taken, in connection with the railway, in the coal deposits of that particular district. There is now in preparation a very detailed report, which cannot appear immediately on account of the delay in the maps. With regard to the collection of mineral statistics, I think much could be done by a properly paid officer under the Geological Survey. The difficulty in the way is, that the mines of the various Provinces are under the control of the Provinces themselves, and consequently, in some Provinces there are departments of mines, Nova Scotia and British Columbia, I think, are the only two—and those departments collect for their own Provinces all the mineral statistics, probably as fully as necessary, and they have the authorty to do so. In the other Provinces there is no authority to collect statistics, and if they are collected by the Geological Survey, they must be collected as a matter of favour from the owners of mines, and that takes a good deal of trouble, and in some cases actual personal visits, as it is not possible to accept a report without some supervision. However, I think it could be arranged. I think that the Provinces which have not got any mining departments should be asked to legislate in some way, to enable the Dominion officers, or anyone who is authorized to do so, to receive reports of the mines directly. In the Provinces which have mining departments, I think, with the permission of the Governments of those Provinces, that the information could be obtained from their Mining Inspectors in advance of its publication, probably by giving the Mining Inspector a small fee for his extra trouble in preparing a duplicate return and sending it on in advance. The information thus obtained could be published in a tabulated form for the Dominion. Of course, with regard to the Geological Survey, there is probably no one on the staff now to do such work. It would take at least one man's whole time, and it would be necessary every two or three years, at least, to visit these mines to keep *en rapport* with what is going on. I think that the matter might be temporarily arranged through the Professors of the Universities in the various Provinces, who teach practical mineralogy, who might undertake the collection of the statistics of each Province for a small fee; probably occupying two or three months of their holidays in the summer time with their collection, and the information could then be published with very little labour as a mass of statistics for the whole Dominion.

Q. Do you think there would be any objection on the part of the people interested in the mines, to furnish such information?—In some cases there would be no objection and in other cases there would be objections. Some mines are held for speculative purposes, and it is not the interest of the people holding the mines to give the information asked for. If you asked them the number of tons of phosphates or coal turned out, and it happened to be a bad year, they would not tell you, because the amount would be so small. Unless there was some regular system, therefore, one would not be able to get the information accurately. I think plans of the mines should also be sent in each year showing the new work that had been carried out. In connection with the Geological Survey of Great Britain,

there is not only a collection of statistics, which is, of course, done under Act of Parliament, but there is what is called a Mining Record Office, in which duplicates of the plans of all the mines, whether working or abandoned, in all parts of the country, are kept, and it is obligatory on the part of those in charge of the mines to furnish these.

Q. Is that a branch of the Geological Survey of Great Britain, or is it independent?—It is under the control of the Geological Survey.

Q. Is that also the case with reference to the statistical information that is obtained under the authority and care of the Geological Survey?—Yes.

Q. And published as a branch of their Report?—Yes.

By Mr. Wood:

Q. How is it in the United States?—Since the organization of the United States Geological Department, which took place in 1879. They are situated as we are; that is to say, the mines are under the control of the various States.

By the Chairman:

Q. But there is a general supervision as well?—A volume was published not long ago in the United States, and I have heard it stated that many of the figures are not at all trustworthy for that very reason. There is no legislation upon which the Survey can act, and they have consequently been obliged to make a sort of general estimate, which is very unsatisfactory; because, if the figures are wrong they are apt to do far more harm than good.

Q. There must be a great difficulty at present, in many mines, of ascertaining what the mineral product of this country is. It is increasing of course, but we are unable each year to find out, beyond the fact that it is increasing. There are various classes of people in the country interested in the products of the different mines, such as copper and iron, not only with reference to the fiscal policy of the Government, but also with reference to the trades themselves. The only way we have of obtaining that information at present is through the Trade and Navigation Returns, and they only refer, evidently, to what is either imported or exported. They do not touch at all upon the metals that are obtained from our own mines and used in our own country, so that there is really no way of getting at our own resources in this respect?—Yes; there is another difficulty. For instance, part of the phosphate mining is carried on in the Province of Quebec and partly in the Province of Ontario as well, and there are no details given for each Province. All that we can get are the total shipments from Montreal, part of which comes from each Province, and of course, in cases like that, it would be extremely desirable to get more information. I hardly see how it is possibly to get the information complete unless the Provinces can be induced to legislate in favour of either furnishing statistics from their mining departments or allowing the Dominion officers to collect them.

Q. Do you think the attention of the Government has ever been called to the advisabilty of such a course?—I do not know. Dr. Selwyn some time ago prepared a circular which, was issued to the owners or those in charge of mines, but it did not work satisfactorily as they may not give the information.

Q. Do you know whether he communicated that result to the Government and endeavoured to obtain the necessary power to make it compulsory?—I cannot say.

Q. Has there been any reference to it in the Reports, as far as you know?—I do not remember. The whole thing occurred before I was connected with the Survey.

Q. I suppose the work of the Department might be called superficial. I suppose it has reference to explorations upon the surface, rather than for the existence of mines; that is not carried on in any sense. The Department neither seeks for mines, nor do they take any special pains to ascertain what mining development there is when it is in the hands of private parties. That is the case, is it not?—Not strictly so. The duty of the geologist, when working in the country, is to examine all the mines also as well as he can. I have always made it part of my duty to do so, although there are not many mines in operation where I have worked. Of course, we do not take mining surveys and levels, because that must be done by the engineer in charge of the mine, and it might certainly be looked upon by him as an intrusion

if any person was to go into his mine to estimate its extent and value. I might also state that in three cases the Geological Survey has undertaken borings where it appeared to be necessary, and the results would be of interest. In the North-West borings were undertaken a few years ago, partly with the object of ascertaining the depth of coal seams, and partly for the purpose of ascertaining whether water could be obtained from artesian wells. Then, several years after that, in 1880, Dr. Selwyn, himself, superintended a series of borings on the Souris River, for the purpose of finding how far east towards Manitoba these lignites could be found, and, therefore, how near Manitoba a supply of fuel could be obtained. Borings were also carried on in New Brunswick. I do not know the exact circumstances, but it was under the superintendence of the Geological Survey. As a rule, borings for developing mineral deposits are more of a private character. They have only been undertaken by Government where they had appeared important in regard to a large tract of country, or where circumstances were such that private individuals did not care to spend money in proving probably difficult questions.

Q. How long ago were those explorations in the Souris District made?—1880. The results are in the Report for 1879-80.

Q. They were made under the personal supervision of the Director?—Yes.

Q. Was it by the employment of an ordinary drill or a diamond drill?—By an ordinary drill. It was done by contract, a bargan being made for so many holes of such a depth and such a distance apart. A gentleman from the oil district of Ontario undertook the borings.

Q. Do you know what was the depth?—It is stated exactly in the Report. One bore was over 300 feet.

Q. Was the result a practical success?—So far as the Souris District was concerned, the depth was considered too great to go for coal in that region, as there was so much coal readily accessible on the river banks. It appeared that this coal sunk to the east, and was too deeply covered to be worth exploring, and thus it fixed the eastern limit of the Souris coal fields for practical purposes.

Q. The Report of the Department then, based upon that exploration, was adverse to the probability of coal existing there?—Yes; at a depth at which it would pay the explorer, and consequently, the operations were not continued.

Q. Were similar explorations made in any of the districts of the North-West—I mean, independent of your exploration of the Bow and Belly River District?—No borings or sinkings in the Bow and Belly River District occurred until the railway was run through the country. Those above mentioned were the pioneer operations, and as there were no means of transport, except by waggons, the difficulties were considerable; but it was looked upon as important, because the scheme for the railway largely depended upon the distance from Winnipeg at which they could obtain their supply of coal.

Q. Has the subsequent supply of coal been due to the operations of the survey or to private explorations?—Partly to each. Of course, many localities have been known from time immemorial, by Indians and half-breeds, who have seen it cropping out along the banks of the rivers. Others were discovered first by the Geological Survey, but the mere discovery of an outcrop of coal has no special merit in it in this country, as you can see it as you go down the river in a boat. What I consider important is to outline this coal between the points at which it is visible, on the maps, not only the outcrops, but the probable continuation and the depth of the seams and their probable course from where the outcrop is seen, may all be given. This particular seam which occurs on the Belly River (the witness here exhibited the map of the Bow and Belly River district) has been traced by us onward to the Little Bow and the Bow, and on to the Red Deer River, and southward was traced to the Milk River Ridge,

By Mr. Dawson:

Q. And where is the coal that is claimed to be anthracite?—On the Cascade River, Bow River Pass.

By Mr. Wood:

Q. What is the character of that anthracite?—It is, perhaps, more strictly speak

ing, a semi-anthracite than an anthracite. It is very nearly the same character as that which is called anthracite in Wales. It contains a little more volatile matter than the best Pennsylvania anthracite. It has about 86 per cent. of fixed carbon.

Q. Is there not a similarity to the mineral called albertite?—None whatever, except in external appearance; its composition is not the same.

By the Chairman:

Q. Referring again to the character of the work of the Survey, of course, during the time of Sir William Logan there had been no mineral development by private enterprise throughout that section of country over which he had control—the old Provinces of Ontario and Quebec—but the position has very much changed since then, not only in the prosecution of the enterprise in these Provinces, but in the Lower Provinces, in which the development had previously been going on. What strikes me is that so great a change in the country in that respect has seemed to have brought about no corresponding change in the Department. In his time he had no alternative to look after the mineral development, but had to inform the world as to the strata of the rocks and things of that kind, but its previous development certainly seems to me to have been entitled to some recognition by the Department?—I think I explained that. In these eastern Provinces, where a beginning has been made, a new system of mapping has been carried out under the Geological Survey. But what I meant was that the system of administration was the same. The system of mapping and field work has been changed. For instance, Nova Scotia and New Brunswick are divided into sheets, and these sheets are published in regular order, so as to make a complete map of these Provinces on a scheme of four miles to the inch. That kind of work was not done in Sir William Logan's time. His time was spent in making surveys of a broader character; but even in his time, the explorations were of use in developing the mineral resources of the country, and the attention of the Survey was not confined to metalliferous ores, but its researches have been valuable in the development of other minerals, such as building stones, limestones, cements, brick clays, &c.

Q. There is a general impression that the Survey, as conducted at present, does not correspond with the expenditure. I do not mean any reflection on the members of the Survey, but with the conviction that some change should be made, and we are endeavouring to get at the views of experts as to what change is necessary. I am not reflecting upon those who are in charge, but there is an idea that the expenditure of the money which is made does not produce any practical result that is correspondingly useful to the country. Now, can you point to any instance in which the explorations of the Survey have ever called the attention of the public to a single mineral deposit, which has been followed up with a beneficial result. Take, for instance, the Chaudière gold fields, the Acton copper mine, the copper mines of the Eastern Townships and also of Lake Superior; in every instance, if the matter had been left to the information of the Geological Survey, the prosecution of the work would never have been started, whereas they are now going on successfully, and if they had been governed by the opinions of the Geological Survey they would never have operated them. Therefore, I am asking you if, in your knowledge, you can point to a single instance in which the investigations of the department have led to a profitable mining industry?—In regard to one of those, the Acton mine, I am not very familiar, but the Chaudière gold fields have been mentioned in one of the Reports by Dr. Selwyn himself, and I know that in conversation he has expressed opinions extremely favourable to those gold fields, and his opinion has weight, on account of his being in Australia, where gold mines are more numerous. With regard to the general functions of the Survey, I think there is a little mistake, not only here, but in other countries. It should be generally understood that the work of a Geological Survey is not to discover minerals. If the geological surveyor were to go into the Rocky Mountains, for instance, and spend the whole summer in hunting up mines, he might have nothing to show for his work. Such work is for those who hope to make a profit out of the mine. In the same way good agricultural or timber lands may be pointed out in a general way by Government

Surveys, but the actual mode of farming or lumbering is a matter for the individual to determine for himself. The duties of a Geological Survey, I think, are often as useful in showing where not to explore as where to explore for mines. To go back to Sir William Logan's time; one of the first things he did was to examine the rocks around the Gaspé and Baie des Chaleurs regions, and report adversely as to the occurrence of coal there, and the result of that, no doubt, was to save a great deal of money which might have been spent in useless exploration. In the same way Sir Roderick Murchison states that in his opinion the money spent in useless exploration in England alone would have been sufficient to pay for a Geological Survey for the whole world. Besides that, there are other instances where the work of the Survey has been directly beneficial. There are certain belts of country in which minerals occur, and the belts in which they do not occur in a sufficient quantity to justify mining operations, and in preparing maps of these, a beginning has been made. We have given every assistance to those engaged in searching for phosphates, in pointing out the belts which were likely to hold large quantities of phosphates. The same is true with regard to the coal fields. As a rule, it is only in a general way that the Survey would be justified in undertaking borings or actual excavations in search of coal, because that would only be increasing the value of some private individuals property, or perhaps spending a large quantity of public money for a negative result, at the same time, a general and complete survey of a coal district can be made. This map of the Nanaimo and Comox coal fields is an example, and supplies information upon which miners can go to work. As for the value of the information supplied, in some cases, it is difficult of course to bring out instances of that. I know, however, that this little report of mine on the coals of the North-West has been thought of value by some gentlemen connected with the Canadian Pacific Railway; and I was told the other day that they had published 10,000 copies of it and sent it to England, for the purpose of inducing immigration.

Q. So that, according to your view, the efforts of the Survey should not be devoted to special localities for minerals. It would be expected that the Survey should ascertain and determine the general characteristics of the various sections of country, so as to indicate the presence or non-presence of metallic substances. Has that been the case with the salt and petroleum in Ontario? Was their presence indicated by the work of the Geological Survey, or was it mostly by accident, or by private exploration or enterprise?—To some extent it has been the case that the Geological Survey has been able to give assistance in that direction by defining the particular folds of the rocks which are most likely to be the best places to bore for petroleum in a district where it is known to exist. Petroleum exists in porous sandstones and fissures in the rocks, and it is irregular in the mode of its occurrence; in fact, it might be described as occurring in almost lake-like areas. Petroleum is one instance where geological investigation, except in a general way cannot be of particular service to the actual miner. It is very different with reference to coal. Petroleum, in that respect, is very much like water; one can indicate, but very generally, the strata which would be apt to produce flowing springs, artesian wells and so on, but that is very different to telling where there is a sufficient supply of water. It requires experiment to determine that point.

Q. You have stated why the result of the work of the Department did not lead the attention of the public to deposits in these regions. But I think you have not answered categorically if that was the fact in either of those cases, whether the Survey indicated the presence of either petroleum or salt?—I am afraid I am not in a position to answer that, because the reports, if any, would be of a date previous to my connection with the Survey.

By Mr. Dawson:

Q. What explorations have there been chiefly in the West?—Chiefly west of Lake Superior and the Lake of the Woods.

By the Chairman:

Q. The information that is embodied in the Report for 1880-81-82 represents the useful result of the work of the Department during these three years?—No; I should

hardly say that it represented it altogether, because, in the first place, it is necessary to boil down the work very considerably, to publish it. There are maps and reports giving every detail in the office, which can be consulted by any one wishing to obtain further information. And then, this Report covers a sort of interim period, when we were in somewhat disorganized state, on account of moving from Montreal to Ottawa. It is dated over three years, in order to bring us abreast of the present time.

Q. At least, it embraces the principal part of the work?—A man might be working for two or three years, and in one particular year he gets his report ready and hands it in. In this way, several years may be ready at once, so that the volume for that particular year will be very bulky, whereas in other years it will be much less.

Q. I was aware of that, and I thought that taking a period of three years would be a fair illustration. If that Report does not represent the useful work of the Department for these three years, what else is there of importance that has been done, which is not included in that Report?—No doubt it gives an abstract of the work. This little report of my own is the result of two or three years' work of myself and assistant. In regard to the other portions of the work, sometimes a few pages may cover no less than six months' work. The palæontological work has, as a rule, been published separately, occasionally as an appendix; moreover, the re-arrangement of the Museum, necessitated by the removal from Montreal to Ottawa, has occupied considerable time. Although that Report shows all that is ready to go to the public for the time being, it cannot be considered as even representing the whole work of the Survey. A great deal of information is often given by letter, and otherwise, which is valuable, but which does not appear in the Report.

Q. Assuming that it is not the whole of it, it is the principle part of it, is it not?—It represents the principal part of it. I would like to state, in this connection, that I think the Canadian Survey in some respects, in regard to the reports for instance, is in advance of many others. Instead of producing, as in the United States, the largest of volumes, with the broadest of margins, and the thickest of covers, so that if you wish to consult the Report for instance, on the Comstock load, it is so large as to be unwieldy, our principle has been to publish the Reports in the cheapeast possible form consistent with utility, and as concise as possible. In regard to the English Geological Survey, they have perhaps even a more systematic method than ours, but the price charged for their reports has been objected to.

Q. While I quite agree with you that the bulk of the volume should not be accepted as any test of the work, still I have no hesitation in saying that the public and this Committee have the impression that the Rreport itself, as indicating the work of the Department for three years, and an expenditure $1,250,000, shows that there is a very little practical result for so large an expenditure of money, and the object of this Committee is to correct the impression that this money was not being properly used, or else to get any changes which may be desirable. I would like to know whether you consider the administration of the Geological Survey at present efficient and satisfactory?—Well, I suppose no two gentlemen who were to organize any service such as this would be quite of the same opinion in regard to its organization. But, on the whole, I think there is no reason to be dissatisfied with the organization of the Survey or with its work. Of course, the matter is quite open to criticism, but I think that if the Public Accounts are looked over, it will be found that the money has not been wasted.

Q. That may be true, but could the money be spent more judiciously? There is no impression that any member of the Department does not do the work his salary represents, but I want to know whether the general administration is efficient, and practically efficient, as giving a result with which the public should be satisfied? The question is, whether the impresion is an incorrect one or not?—I am speaking of the part of the work that I am familiar with. As far as I know, I think the administration and the work of the Geological Survey is very satisfactory, and the results obtained are as great as can be expected from the expenditure, when the character and extent of the country in which we have to work is taken into consideration. Of course, some minor improvements might be made, but that would be a matter of

opinion, and people might differ as to the mode in which it should be accomplished.

Q. But in your opinion the system is generally satisfactory?—I think so. However, I would certainly admit of the value of the collection of statistics bearing on the mines of the country as a very important addition to the work of the Survey.

Q. Would that add much to the expense of the Department?—Not if it were conducted in the way I have already suggested. Of course if you engage a gentleman specially he would have to devote his whole time to the work, and it would involve his salary and travelling expenses. It is very difficult to get the right kind of man for the work.

Q. There is an impression that there is a lack of harmony among the subordinates. Is that correct?—I fear there are some gentlemen on the staff with whom it would be very difficult to be harmonious, and that they might object to something, whatever was done, but I may say that I think that if there is any dissatisfaction or friction on the part of any members of the staff, it largely arises from the fact that salaries of many are not sufficient, and when a man finds himself pinched, from a pecuniary point of view, he is apt to be irritable on other questions, and the gentlemen who are in the lower ranks are in that position. I think it would be very important that some of the salaries should be fixed at such a figure that the members of the staff could see that by diligence and in course of years, at any rate, they would arrive at something like a competence or fair remuneration for their services. The members of this Survey are different in many respects from those of other branches of the Civil Service. They require a prolonged course of training and education, and may be considered as professional men, and should be remunerated and treated accordingly. As I stated before, unless you get a man who is enthusiastic it is very difficult to know whether he is doing his work satisfactory or not. A report must not be judged by the number of sheets of foolscap or its size. When a gentleman is out in the field for perhaps six months, with the supervision of his party, he has a position of great responsibility, and this should be taken into account.

By Mr. Baker:

Q. Are the officers on the staff of the Geological Surveys generally satisfied with being on the Civil Service list, and under the Civil Service Act?—I think there is a general dissatisfaction among the officers, owing to the fact that they rank as clerks of various standings. They think, and quite rightly too, that they should go into the list of professional men and experts, rather than rank as clerks. Personally, I have no objection as to what they designate me, but I think there was a feeling of dissatisfaction on that point last winter.

Q. There is no distinct understanding in the Department as to the order in which you rank, is there?—The Department is divided into certain branches, there being four Assistant Directors, and if the Director were absent, the charge of the Department would devolve upon one of them, very often devolving upon the one that is left in the office. Two of us are very often in the field. In 1876, when Dr. Selwyn was in Paris, he left me in charge, but it is a matter to be arranged for convenience, of course. In regard to the subordinate officers, they are, as a rule, classified under their various heads.

Q. From a Civil Service point of view, what is the corresponding rank to that of your own, for instance?—I think I am classed as a Chief Clerk. I do not care what they call me. It is a matter of classification according to salary

Q. Is the Director of the Geological Survey considered in the light of a Deputy Head, as in the other departments, or is he considered the head of a special branch?—I think he is considered the head of a special branch, with a rank equivalent to that of a Deputy Head, except that he has not the franking privilege.

Q. Do you not think that if the Geological Survey were divided into Provincial Departments more systematic and beneficial results would ensue? For instance, in regard to British Columbia, if you were left to complete that work, instead of proceeding in a desultory manner, would it not be done more expeditiously and more satisfactorily?—On the whole, I think that is the case. I was continuously occupied how-

ever in British Columbia during the summers of 1875, 1876, 1877, 1878 and part of 1879, but had not been there since until last summer, when I was working in part of the Rocky Mountains, which included the western slope to some extent. Before I went out to British Columbia, Mr. James Richardson was working there, I think, from 1871 to 1875, both years inclusive. I think it would not be advisable to establish separate offices in the several Provinces.

Q. But if you, yourself, for instance, were to go into a certain field and continue the work there until it was completed, would not the work of the Survey be much more satisfactory, and would not the thread of the report be much more connected? —That is quite true, and that is why I spoke before of two classes of Surveys—one in the Eastern Provinces and another mode in the West. Almost every year I was requested to go into particular districts through which railway explorations were being carried on, to give an idea of the practical value of the railway. In British Columbia, owing to the size of the Province and the distance apart of the localities, our attention has been confined largely to the regions which were considered as probable routes of the railway, and attention specially given to the coal fields and the mines. For instance, Mr. Richardson examined the Nanaimo and Comox coal fields. Other coal fields were known on Vancouver Island, but as it was considered impossible for them at present to compete with these two, it appeared unnecessary to make detailed examinations of them at present. In the meantime, it was thought proper to go on with the work more immediately useful. Sometimes a district is found rich in economic minerals, and intervening districts are left for the time being for subsequent investigation.

Q. Are there no some portions of Vancouver Island of which you have no precise information, from a geological standpoint?—The only precise information we have is with regard to the Nanaimo and Comox coal fields. We do not know the west coast at all.

Q. Have you any knowledge of the coal deposits in Quatsino Sound?—Yes; I visited that place in 1878 and made a preliminary examination, but as it was not complete and it was not likely to compete with the known coal fields, a report was never published, but I have the results at the office.

Q. Taking into consideration what has been done in Vancouver Island, what quantity of work still remains to be done, and what, in your opinion, would it cost to finish up the work, and how long would it take?—We have two classes of maps in the Geological Survey—a preliminary map, which gives the main features, and a finished map, which it would be impossible to make for some time. I think a preliminary map could be completed with about two years more work.

Q. What would that probably cost?—Roughly speaking, I think two good men, working together or apart, as the case might be, and a small staff, would be sufficient to complete the work in the way I have indicated. With regard to the west coast, one would really require some kind of steam launch; you cannot trust sailing vessels, as they are so often becalmed. I experienced that before, when I went in a schooner to the Queen Charlotte Islands.

Q. And a steam launch would not cost more than $4,000 or $5,000, and would give you a sort of floating house?—Yes; we could sleep on board, which would be a great advantage. And then we should have a small boat to make excursions along the shores. The cost of the expedition, besides the two gentlemen in charge, should not exceed $2,500 a year for the summer's provisions and all other expenses on a survey of the kind I have referred to.

Q. The reason I ask is, that if the funds are not provided by the Government they may be by private enterprise. We have arrived at a stage when this information, with regard to the coal regions, is required. You mentioned that in Nova Scotia and British Columbia there were certain systems of collecting statistics?—I think there are reliable statistics in Nova Scotia, but with regard to the gold of British Columbia, there are great difficulties in the way of getting them, because there is no way of telling how much is carried away privately by individuals. A few years ago Mr. Charles Good, Deputy Minister of Mines in British Columbia, worked with

me in revising the statistics of the gold export of that Province, and after we had ascertained the amount of what had been actually shipped, we put down one-third more as having been carried away privately.

Q. Is it not a fact that a much larger quantity of gold has been taken from British Columbia than the amount mentioned in the Trade and Navigation Returns—$18,000,000, during the last fifteen years?—It is more than $40,000,000.

Q. In addition to that amount, is it not a fact that sums varying from $500 to $5,000 are carried away by Chinamen without the knowledge of the authorities?—I think that is not improbable. I have no doubt they do carry away a great deal, and many of the white miners also carry their earnings to San Francisco.

Q. Are you of the opinion that if the Director of the Geological Survey were free and unencumbered by any outside influence, that the business of the Survey would be much more satisfactorily and successfully conducted?—I think that the greater freedom which he is allowed the better; because the men will come to understand that they have got to please him, and will work accordingly. So long as there is a division of the responsibility in the appointment of the men on the staff, there will always be friction.

Q. And the same remarks would apply to the principal positions under the Director. As regards the appointments, I suppose they should be free from political patronage?—Certainly.

Q. Do you think it will be necessary in the immediate future have a larger staff?—That is a matter for Parliament to decide. With a larger staff we could certainly get on faster with the work. Just at present the vote has been largely increased, and I do not think we will spend the whole of it this year, as it is impossible to increase the staff all at once. I think the Director should have the power to take on good men whenever he can get them. I think it desirable to increase the staff still more, but it should be a gradual process, each want being filled as it occurs, and the Director should be allowed to select men with the proper training.

Q. Could gentlemen of such calibre be secured readily, if proper salaries were paid to them?—I would not say readily, but there are opportunities for getting them occurring at all times. For instance, the Geological Survey of Great Britain have just finished a map for the whole of England, on the scale of a mile to the inch, and I think it quite possible that the men who have been engaged at that work might be free to engage elsewhere, as the staff of the Survey is very likely to be reduced. There are occasions of that kind when geologists can be secured by paying them proper salaries.

Q. Do you think that the amount of money voted annually is, from your point of view, what it should be?—I could not give a definite answer to that. I think we are scarcely likely to expend our whole vote for this year, but it is quite probable that it might be expanded from year to year. I do not wish to speak with authority, as I do not keep any account of it. Dr. Selwyn has control. I receive for my own work a general grant—usually what I estimate for the work—to spend in carrying on my portion of the work as I think best.

Q. Do you not think that if the geological department were relieved from topographical work, that greater satisfaction would be given in the work of the Survey?—I think it would, on general principles, and in countries where there are good topographical maps, such as the ordnance maps of England; no one would think of doing topographical work on the Geological Survey. However, it is the case that in a new country, especially, the maps are not reliable, except quite locally, for the geological work, and that necessitates corrections in places where topographical maps are made; and then it is very often necessary to supplement the work by the land surveyors, because they are often not alive to the features of the country, from a geological point of view. In other cases it is often necessary in following the land surveyor to make a map *de novo*. Although I quite agree that it is better to relieve the Geological Survey of topographical work as far as possible, yet there is no doubt that there are cases where the topographical and geological work must both be done, and the United States Survey have found this to be the case, especially in

mountain districts, in which case a small party might be attached to each survey for topographical work, which would give more time for the geological part of it.

Q. In that case, I suppose the topographical party should go in advance of the actual geological party?—In some cases it should, and in other cases I think the two might go together very well. For instances, when the survey was made in the Rocky Mountains, we occupied a large part of the time in making topographical route surveys, and if I had had a topographer with me I could have devoted more time to the geological structure. I would not recommend topographical work which would imply sending a topographical surveyor into the field in advance of the geological corps; that would devole upon the Department of Dominion Lands and should be undertaken by them, if necessary.

Q. But should there not be maps from the Dominion land surveys which should be sufficient guides?—In that part of the country where the land is divided into sections or quarter-sections, but unfortunately the gentlemen connected with the surveying of these blocks, do not pay sufficient attention to the topography, which is very necessary.

Q. Would you please state what you considor the boundaries of British Columbia?—I think the eastern boundary must have been fixed by the Imperial Government about 1858 or 1859 (when it was made a Crown colony) at the watershed or main divide between the waters of the Hudson's Bay and the Pacific. In fact, I know it was assumed to be such by the British Columbia Boundary Commission, in 1863, who erected their terminal post, at the intersection of the watershed with the 49th parallel. I have always understood that it runs on the watershed of the Rocky Mountains up to the 120th meridian, thence north to the 60th parallel and thence west to the western boundary, where it joins Alaska. The western boundary again is fixed by Treaty with Russia, and the same Treaty rights govern the United States in regard to it.

Q. If the southern boundary were carried on along the 49th parallel it would cut off a part of Vancouver Island?—The 49th parallel was defined as the boundary line merely to the coast. The western boundary, with regard to Alaska, is very indefinite. In the Treaty, it is described as the coast range of mountains, and where this range does not lie more than 30 miles from the sea. If the coast range is further inland than 30 miles, then it follows parallel to the coast, but 30 miles distant. The latter has been assumed, but I think if it were properly defined it would be found to be only 1 or 2 miles from the coast.

By Mr. Cameron:

Q. Is it not important in mining districts to have the reports of the Geological Survey published as soon as possible after the surveys are made?—Certainly; as soon as it is possible to publish something like a complete and definite report of the district.

Q. Complaints have been made from Cape Breton and from eastern Nova Scotia that surveys made five or six years ago have not been published—neither the reports nor maps in connection with them. Is it not rather an unusually long time to delay the publishing of such reports?—I am not aware of the special circumstances, because I have had nothing to do with the work there. But I suppose if the reports had been ready they would have been published, unless delayed by the slow progress of the maps.

Q. Does the responsibility for the publication rest with the Director of the Survey?—The gentleman who makes the survey hands in his report, together with a map of the district, when it is finished, and if the report and map are in a state to be published, they are sent to the printer and the map engraver as soon as possible, to form part of the next annual Report. I think there is something to be said in favour of pursuing another plan: that is, of publishing a short synoptical report annually, and to publish afterwards a separate report of each district with a map; and if desirable, these could be arranged so as afterwards to be bound up in a volume.

By Mr. Dawson:

Q. I have read your report on the country along the boundary, and a very inter

esting report it is. I think you also made explorations in the vicinity of the Lake of the Woods?—Yes, in 1873.

Q. You discovered some granite there, which is likely to be valuable?—There is a large quantity of granite and other building stones in that vicinity. At the time I was there none of the metalliferous deposits had been discovered. I saw a few veins, but nothing worth reporting on. But while I was at the Lake of the Woods my time was mostly spent in determining a moot question, as to whether the limestones occurred on the south shore. They do not occur in place there. There are fragments of limestone found south of a certain line across the lake, but north of that you will find no fragments of limestone. These fragments become more and more abundant as you go south.

Q. Where are these fragments likely to be derived from?—It is very difficult to tell. I think it is very likely that they come from the direction of Winnipeg and the Manitoba Lakes, along the edge of the Laurentian range. Most of the glacial striation on the Lake of the Woods was from north to south, but besides that, in a few places I had noticed striæ is at right angles, indicating the movement of ice in the direction that I have already spoken of, which followed along the Laurentian range.

Q. I believe the line of division between the older rocks and the newer extends northward along the chain of lakes?—Yes; they extend along these lakes, the older rocks on the one side and the recent formations on the other.

By Mr. Mulock:

Q. How many parties had you in the field last summer?—I think there were eight or ten altogether.

Q. The progress of the work, I suppose, depends largely on the number of parties?—Yes, each party taking a district.

Q. Have you any idea of the cost of each party?—It varies very much. A few hundred dollars may be all that will be required to meet all the necessary expenses in the older Provinces, such as hireing canoes, &c., for transport; while in the western regions it is often necessary, for means of transport, to buy waggons, horses, &c., as being the cheapest in the end, and then the arrangements which have to be made for a complete camp outfit, and the wintering of the animals, involves a large expenditure. Where $1,000 would be sufficient for the expenses of a season's work in the east, it would require, for a party of the same size in the west, perhaps from $2,000 to $3,000.

Q. Do you think it would be well to increase the number of parties?—Of course by increasing the number of parties as fast as you can get men to conduct them, the Surveys of the country would be more rapidly advanced, but that is a question for Parliament to decide.

Q. Taking your present strength, can you form any idea how many generations or centuries it would take to do what ought to be done in this direction for the Dominion?—It all depends on what class of work you go into. England has been undergoing a Geological Survey since 1832, and just the other day a map of England has been finished on a scale of one mile to the inch.

Q. How many parties were there?—A very small number at first, and they gradually increased,

Q. Have you any idea as to the exact number of parties which they had?—I suppose they probably had ten or a dozen parties, but I am afraid I cannot give you any reliable information on that point, although I was working there for one summer.

Q. They had many more parties than we have here?—Yes, relatively to the area of the country.

Q. And still it took them half a century?—I do not think that mapping on so liberal a scale would be necessary here. Our map of Nova Scotia and New Brunswick is on a scale of four miles to the inch.

Q. Taking the Province of Ontario, are there not supposed mineral districts wholly unexplored as yet?—I do not know of any. There may be. As regards the Peninsula, it has been pretty thoroughly gone over; but with regard to that portion north of Lake Superior, only a beginning has been made, and it had been confined to the lake shores and along the course of the various rivers. The geology of the Penin-

sula of Ontario is a succession of outcrops of formations of varying width, in accordance with the steepness of the dip and the shape of the surface.

Q. I think you were in charge of the party that examined the supposed coal or lignite districts of the North-West?—Yes.

Q. There has been, I understand, a discovery of anthracite coal there?—Yes, at Cascade, on the Bow River.

Q. It is hard coal, is it not?—I explained that it was more nearly a semi-anthracite than an anthracite.

Q. I understand that the persons who are interested in this mine or who made the discovery say that the Survey reported against the probability of any such find, and that subsequently the coal was found or discovered against the best opinions of the Survey. Do you know how that is?—I am perfectly confident that no report was ever published of that district, and has not been, on this side of the mountains, except Dr. Hector's report, in 1859, under Capt. Palliser. I am sure that no such official statement has been made; I think not even as a verbal statement or a letter. I am quite free to admit, however, that from a general knowledge of that country one would have been justified in designating the discovery of coal as improbable, because most of the mountains are of limestone, and this coal lies in a small trough, which might be called a geological accident.

Q. So that it does not follow at all that coal will not be found to any large extent?—I speak now from the facts, and the facts are that this trough of coal has a certain width, about two miles between the mountains. It runs north and south, but we do not know exactly how far. I was there late in the fall, and there was snow on the mountains, so that it was difficult to tell; but we will be able to ascertain the length of it next summer. But I have only seen anthracite coal there in one place, the rest of the coal which I have seen in the mountains being bituminous. It was a surprise to me, but one is always liable to be surprised. If all these things could be theoretically determined, it would not be worth while exploring.

Q. Do you think that it would be advisable to have more parties put into the field than the present appropriations admit of?—I think a gradual increase would be very desirable, indeed. I do not think it would have a very beneficial effect to suddenly increase the men, as you might get a lot of incongruous results and get things generally mixed up. But a gradual increase might be made from year to year.

Q. It should be a matter of policy, then, in the Department, to increase the number of parties in the field as speedily as that work can be efficiently done?—Yes.

Q. That has not been the aim of the Department up to the present?—There is scarcely any year that there has not been an increase.

Q. How many parties were there last year?—Eight or ten.

Q. In the report up to the end of 1880, it appears that there were six districts reported upon. It took at least six parties, or perhaps more, to make this report?—Yes.

Q. Has there been an increase in the number of parties in the field in the last four years?—Yes; I think so, although I could not say how much. There has been a general tendency to increase, and also to allow gentlemen to go into the field, in charge of parties, with one or two assistants.

HOUSE OF COMMONS,
OTTAWA, 18th March, 1884.

The Select Committee on Geological Surveys met this afternoon, Mr. HALL in the Chair.

ROBERT BELL, Esq., C.E., M.D., L.L.D., Assistant Director of the Geological and Natural History Survey of Canada, was called and examined.

By the Chairman:

Q. What is your age?—Approaching 42.

Q. How long have you been connected with the Survey?—Since the beginning of 1857, with the exception of some slight interruptions.

Q. What previous experience or study had you to qualify you for a position connected with the Geological Survey?—I was very young at that time, only a boy in fact, but my father was the principal amateur geologist in the Province of Ontario and had the best cabinet of fossils, rocks and minerals, and before the commencement of the Geological Survey of Canada had mapped out the geological formations, so that from my earliest recollections I had the benefit of his constant teaching on the subject, and I had read all I could. My father had the best library of geological books up to that time, so that when he died, Sir William Logan, knowing these things, took me in hand, and from that time he took great pains with me, and I have heard him remark to leading geologists what he had done with me, and they have said that if he taught me all these things I must be a good geologist. That was up to the commencement of my career with Sir William Logan.

Q. Would you also state what your educational advantages have been?—I enjoyed a good common and high school education, and afterwards I studied land surveying in Upper Canada, and passed the preliminary examination and then civil engineering and surveying, with the natural sciences, at McGill University, where I took the degree of C.E. with first-class honors in natural science and mathematics, prizes and so on. After that I went to Edinburgh, where I studied zoology and geology under Prof. Allman, botany under Prof. Balfour, and chemistry under Prof. Lyon Playfair and his assistants, Professors Dittmar and Fairley, who are now both leading professors of chemistry, and also under Prof. Alexander Crum Brown, who succeeded Prof. Lyon Playfair.

Did you take a degree at Edinburgh?—No; I took Prof. Playfair's certificate for practical chemistry, and also those of Professors Dittmar and Fairley, as well as that of Prof. Crum Brown. Afterwards I became a professor of chemistry and the natural sciences generally, at Queen's University, Kingston; held that Chair for about five years, and gave it up with a view of perfecting myself in subjects bearing on geology. I also studied medicine in McGill University, and graduated as a physician and surgeon in 1878, and last year, in recognition of my services to sciences, &c., Queen's University granted me the degree of L.L.D. I might also mention that I have been a fellow of the Chemical Society of London, and am a fellow of the Geological Society of London, and of the Royal Society of Canada, besides belonging to numerous minor societies.

Q. What was the *personnel* of the Geological Society at the time you joined it?—It consisted principally of Sir William Logan, as Director; Mr. Murray, Assistant Director; Dr. Hunt, Chemist and Mineralogist; Mr. Billings, Paleontologist; Mr. Richardson, Field Geologist; Mr. Richard Oatey, Practical Miner, and Mr. Barlow, as Topographer. There was also a Mr. D'Urban, Naturalist and Botanist.

Q. What position was assigned to you when you first became connected with the Survey?—I was first Assistant Geologist; I assisted Mr. Richardson, and afterwards Mr. Murray, but as we had very few men, Sir William thought fit to send me on independent expeditions after about three years probation, though I was only in my teens then.

Q. So far as you recollect then, would you state briefly the changes which occurred just after Sir William Logan's resignation?—The first great change which

took place after Sir William Logan's resignation, was the resignation of Dr. Hunt, I think, from two to two and a-half year's afterwards.

Q. What was his position ?—Dr. Hunt was officially chemist and mineralogist, but he was also the real adviser in chief in matters relating to the literature of geology and geology generally.

Q. Had he been connected for some time with the Survey ?—Yes, for a long time. At the time of his resignation, I suppose, he had been about twenty-five years connected with the Survey, his services in connection with it having commenced shortly after the establishment of the Survey. Dr. Harrington succeded Dr. Hunt, and remained on the Survey for several years, I think from 1873 to 1879. Dr. Harrington left, and Mr. Hoffmann, who had been assistant, was appointed in his place. Mr. Billings became connected with the Survey about 1855, and acted as paleontologist for a good many years; being connected with the Survey after Dr. Selwyn came. When he died Mr. Whiteaves, who had acted as assistant paleontologist for some two years, at a nominal salary—he worked for the love of the subject and lived on his own means—was eventually appointed; but they had great difficulty in getting the appointment confirmed. It was finally confirmed, however, principally on the recommendation of the medical men of Montreal, who appreciated his devotion to science, and were aware of his fitness for the position.

By Mr. Holton:

Q. What were the difficulties connected with his appointment?—Another person wanted to get the position and wished to have Mr. Whiteaves deprived of it. No one, for a moment, disputed Mr. Whiteaves' capacity and claims for the place.

By the Chairman:

Q. Was it political or personal influence?—Personal, with as much political influence as could be brought to bear. Mr. Murray was connected with the Survey from the beginning until he went to Newfoundland; he was invited to undertake the Geological Survey of Newfoundland by the Government there, and he was still to be, in a manner, connected with the Geological Survey of Canada. Sir William Logan had, with the consent of the Government, promised to allow the principal officers to give him all the assistance they could. The Government of Newfoundland could not afford to pay the expenses of a whole staff, so we were to help him with his work, in the interest of science generally, and to assist in elucidating the geology of the eastern part of Canada. Some time after Mr. Murray left, it became evident that he was going to stay there altogether, so the Government of the day agreed to fill his position by appointing myself as assistant director. There was considerable delay in getting this brought about. I do not exactly understand it, but there was some difficulty in recognizing my position, on the part of the Director, and instead of appointing one assistant director he caused four to be appointed, which gave me no improvement at all, because it raised the other three to the same rank as myself.

Q. Did Mr. Murray occupy the position of assistant director exclusively ?—Yes; he was called Assistant Provincial Geologist, Sir William being Provincial Geologist.

Q. And he was the only one?—Yes; they could not afford to make them all assistant directors, and only one is competent to work in harmony with the rest of the staff. If you have half a dozen heads there will be trouble in the camp; Sir William recognized this, and was not likely to make a mistake. Mr. Richardson was on the Survey from nearly its commencement, and remained on till about three years ago, when he was superannuated, although still able to work.

Q. Was he superannuated at his own request ?—I am not quite sure about that, but it was not according to his own wishes; he might have requested it as the least of two evils. Mr. Richardson died last autumn. Mr. Barlow was working for the Survey, though not appointed on the permanent staff, before my time, and he was superannuated a few years ago, although still able to work. He was probably the best topographical draughtsman in the Dominion, so far as we are aware. He was succeeded by his son, Mr. Scott Barlow, who, I should mention, has been on the Survey for a long time, and is now in the position which his father occupied. Mr. Vennor was at first my assistant. Sir William Logan, writing from London, in 1865, requested

me to take him as my assistant, and I did so, and he remained on the staff until 1881. Mr. Vennor served from 1865 to about 1881. Mr. Robb was employed on the Survey many years ago, I think from about 1868, as mining engineer and field geologist. His profession was that of a mining engineer, but he was also a good geologist, and had written a book on the Metals in Canada, and was regarded as a good geologist and mining engineer. He was a brother of the well-known Professor Robb, the great geologist, of New Brunswick. Mr. Robb resigned; I think he served about eight years. Mr. Weston, joined the Survey few years after myself, and is still connected with it; he came as a lapidary and librarian, and is now collector of fossils and curator of the paleontological department. Mr. Fletcher joinedthe Survey about fourteen years ago; he is one of the field geologists, and still remains. Mr. Fletcher was taken, probably, on account of his knowledge of geology and mining, at the time he was appointed; he was a son of a practical miner, Mr. Hugh R. Fletcher, who for many years was in charge of the Bruce Mines, and afterwards in charge of mines in the Lower Provinces. Mr. Fletcher is a practical miner and a distinguished geologist, and was also a distinguished graduate of Toronto University; he took the first prizes and first-class honors in every year during the four years of his course in that University, and I think all his brothers have done the same; one of his brothers is Professor Fletcher, of Queen's University. Mr. Ells was appointed about the same time as Mr. Fletcher. Mr. Ells had studied in McGill College, graduated in Arts, and had a natural taste for geology and is now a field geologist; he is still on the Survey. Mr. Webster was on the Survey about fourteen years as a field geologist, as one of Sir William Logan's assistants, and afterwards as an independent field geologist, working in the Eastern Townships; he had about fourteen years connection with the Survey and left about two years ago. Mr. Ord was another field geologist who had been on the staff some nine or ten years; he left about three years ago. Mr. H. Y. L. Brown was another member of the Survey; I understand he was a geologist in Australia, and came here at the request of Mr. Selwyn, from Australia, and with the promise of a good position, similar to that which he occupied in Australia and at a good salary. Mr. Brown only served about three years and left about eight years ago, going, I believe, to England; he was a mining engineer and geologist, a man of great ability and capacity, and a very gentlemanly and courteous man. Mr Broad was on the Survey for about six years, up to the present year, and I believe was virtually dismissed. Mr. Broad was a field geologist, and first assisted Prof. Bailey or Mr. Ells, and was then entrusted with independent work, which he continued for five or six years. He was six years altogether on the Survey, and I understand was virtually dismissed. I might also mention Professor Bailey, of the University of New Brunswick; he was connected with the Survey twice. Professor Bailey was connected with the Survey for some years, doing work in the summer holidays, and reported at his leisure in the winter, without coming here. This had been quite allowable in other cases, and he was in reality an officer of the Survey, although writing his reports in New Brunswick. Well, he left the Survey for a while, and after Mr. Broad's dismissal, he was asked to come on again and take up the work Mr. Broad had had in hand. Mr. Matthew had also worked during his summer holidays in connection with Professor Bailey, and is regarded as a very good geologist; he was offered a position as geologist on the International Boundary Commission, but he could not accept it and another was appointed in his place. I am referring to the United States Boundary Commission that commenced operations in 1872 and continued until 1875. Mr. Matthew refused that appointment, but worked for some years on the Geological Survey; he is not now employed. Dr. Geo. Dawson has been on the Survey since he completed his work as geologist on the Boundary Commission just referred to; I think he has served about seven years out of nine, having only worked one year out of the three preceding the last. The next gentleman whom I will speak of is Dr. Spencer, now Professor of Natural Sciences in the University of Missouri. He was a born naturalist and geologist, and his natural leanings induced him to study these sciences at the University, where he graduated as a mining engineer and

natural scientist—I refer to McGill University—and afterwards received the degree of M.A., and Ph. D. from one of the German Universities. He was a very pushing and clever man; he assisted me one year in the North-West, and was employed in the office for one year. He only served me one year in the field, and then left. Another gentleman who worked with me for some time was Mr. Peter McKellar, who was an excellent expert in mining matters; he worked with me for two years, but did not care for any permanent appointment on the Survey. Mr. Alexander MacKenzie was on the Survey, I think, for nearly five years; he came as a miner, and had been a practical miner in Nova Scotia and elsewhere; he also left. I might also speak of Mr. Foord; he came as artist to the Survey, in succession to Mr. Smith, who had died before Dr. Selwyn's time. Mr. Foord was afterwards appointed as assistant palæontologist to the Survey, but left last year. Mr. Molson is the next to whom I might refer; he was with me for two years, and had the promise of a permanent appointment, but finally declined to take it. Mr. Molson, I might mention, was a distinguished graduate in science, and a gold medalist of McGill University. Mr. Grignard worked for a year or two on the Survey as artist, after Mr. Foord became more of a palæontologist. Mr. Joseph Tyrrell is a gentleman who joined the Survey about three years ago, and his name was temporarily left off last spring, but he was put on again and is still connected with it. Mr. Fraser Torrance is another gentleman who has been connected with the Survey. He was a mining engineer and was employed to work in the phosphate regions in the County of Ottawa last summer, but he was discharged during last month. Mr. Coste is another who has been connected with the Survey for about one year. He was dismissed temporarily a short time ago, but has been reinstated. He is a mining engineer and a graduate of the Ecole des Mines, of Paris, and is a gentleman of much learning and at the proper age promises to be a highly valuable member of the staff. Mr. A. S. Cochrane is still on the Survey, and has been for about seven years; he was temporarily dismissed once or twice, but is still at his place, at small pay. His position is rather undefined; he has been considered assistant field geologist, but has really been doing draughting in the office, principally in connection with my work. He has been trusted with independent surveys for at least three years, and is really a junior field geologist and topographer. There is on the list a Mr. Low, who is now a field geologist; he is still on the Survey, being quite recently appointed. Mr. R. G. McConnell, assistant field geologist, is still on the Survey. On the list are also the names of Mr. McMillan, assistant field geologist, who is still on the Survey, and Messrs. Faribault and Giroux, assistant field geologists. Then, in the house staff there is Mr. Frank Adams, assistant chemist and mineralogist, and formerly an assistant of my own in the field. He is a good geologist, and still does field work in the summer, working in the laboratory in the winter. Mr. Willimott, is assistant curator of the mineralogical department and also a collector of minerals. Mr. Brumell is Mr. Willimott's assistant. There is also Mr. Broadbent, assistant in the Museum, and Mr. Ami, assistant palæontologist. Dr. Thorburn is librarian. He is not on the Civil Service list, but he is acting as librarian of the Survey. There are also a caretaker, messenger, door-keeper, yardman, &c.

Q. Has any change been adopted in the system under which the Survey was organized since your first connection with it? Is it still conducted under the same system as it was when you first joined it?—Not exactly. When I first joined it the main idea was to make our work have special reference to the mineral development of the country and the discovery of economic minerals.

Q. In what respect has that been changed?—Well, very little attention has been paid to mines latterly, and a great deal of attention to other matters. The proportion of the indoor staff has greatly increased, but still the work done is somewhat different, on account of the greater area and the pioneer sort of work we have to do, instead of being confined to more exact work in limited areas. It has been changed from a Geological Survey of Canada and now bears the name of the Geological and Natural History Survey of Canada, and we have endeavoured to pay some attention

to natural history. Latterly a botanist has been appointed and a great deal of attention appears to have been devoted to Indians, and also to journals of travel.

Q. Have these changes, with reference to the attention paid to mineral subjects, come about by reason of the change effected by Confederation, and on account of the larger area, or by changes suggested by the Director himself?—Partly both to the greater area and the small staff, it being necessary to do more preliminary work, and also to a great extent to the present Director's views as to the object of the Survey being different from those of Sir William Logan. The history of Sir William Logan's career, as recorded in the Reports, shows clearly what he conceived the Survey to have been instituted for.

Q. Would you mention that in brief?—Sir Wm. Logan was distinguished as a practical geologist in regard to coal mines, having been the first to trace out the coal fields of South Wales, in such a way that his plans were adopted by the official survey of Great Britain, and consequently when he came here he had a good idea of coal mining, which, in this country, was of great importance, and one of the first problems solved by the Survey was the existence or non-existence of coal. Sir William thought it might be found in the Gaspé Peninsula, his first two years being spent there, and he was accompanied by Mr. Murry and also the chemist and mineralogist of the Survey, with the view of discovering the existence or non-existence of coal in that region. He had great hopes of finding it there, but of course the whole country was unknown, geologically, at that time. It was known that copper and silver were to be found on Lake Superior, and the Bruce Mines were found on Lake Huron, and therefore Sir William paid particular attention to the Lake Superior and Lake Huron districts. In all the work that was afterwards done, the economic minerals had the most prominent place, the search for them forming a most conspicuous portion of the Survey. Sir Wm. Logan employed, about the time when I first came to the Survey, a Mr. Oatey, a practical miner, whom he sent to examine mines, and to give his practical advice to assist the miners, this being a young country and very little being known about practical mining. Mr. Oatey was sent to collect specimens under Sir Wm. Logan's directions. Sir William had done all he could, up to that time, and kept in advance of any mining development which was going on. He also devoted himself to structural geology, although the materials he had to work upon were not nearly so inviting as now. The geology of Ontario and Quebec is very meagre, as compared with the Dominion as a whole. Well, Sir William and his assistants were such men as to make the Survey interesting, and one of the foremost in the estimation of scientists in Europe, notwithstanding the meagre field they had to work in. Sir William elucidated the structure of the most ancient rocks, the Laurentian, and gave them their true character and the name, which has been recognized all over the world, and Mr. Murray the Huronian rocks. And then, Sir William solved some problems puzzling to the geologists of the world at that time, as to the true geological position of the rocks of the Eastern Townships, which are a prolongation of the rocks of the Appalachian chain. At the same time he superintended the geological work in all other parts of the country, assisted by Mr. Murray and myself, including the geological work in connection with Ontario and Gaspé and all the country north of the St. Lawrence; indeed, the whole Provinces of Ontario and Quebec had been covered, with the exception of the more remote and less interesting and important regions.

Q. What changes are observable in the present direction of the Survey in these respects?—When Mr. Selwyn first came he did not make any very radical change. I was engaged in collecting mining statistics, as a volunteer sort of work, for a few years previous, and Dr. Selwyn agreed to continue this for the Provinces of Ontario and Quebec, under my direction, and for the Provinces of Nova Scotia and New Brunswick, under the direction of Mr. Hartley. I submitted to Dr. Selwyn a copy of the questions which I had been sending out, requesting information with reference to mining sttaitisos. The circular which accompanied these questions was as follows:—

DOMINION OF CANADA.

RECORDS OF MINES AND MINERAL STATISTICS.

It has been decided to institute, in connection with the Geological Survey, a systematic collection of records of mines and of statistics of the production and consumption of minerals in the Dominion. As it will be impossible to effect this, so as to secure reliable and valuable results, without the cordial co-operation of all persons interested in mining pursuits, owners, directors, managers and agents of mineral properties, and iron masters, smelters, and metal merchants, are invited and respectfully urged to lend their hearty assistance towards promoting the object in view.

The great and permanent value to the mining interests of the country, of such records and statistical information, when carefully collected and compiled, is so well recognized and established that it does not need to be dwelt upon.

To facilitate the work, the annexed form has been prepared for circulation; and it is hoped no difficulty will be experienced in getting it promptly returned to this office, with as much information, under the respective headings, as can be conveniently given.

As the mineral statistics are intended for publication with the annual reports of the Survey, it is desirable that all returns for the year should be sent in as early as possible, and in no case later than the 31st January.

Statements given in confidence will be used only to aid in the compilation of totals; and it is hoped that inability to reply fully, or even in part, to all the queries, will in no case be considered a reason for altogether witholding information, however scanty, which can be given without inconvenience.

Prof. R. Bell, and Mr. Edward Hartley, have been requested to undertake the collection and arrangement of the returns; Prof. Bell, in Ontario and Quebec; and Mr. Hartley, in Nova Scotia and New Brunswick.

ALFRED R. C. SELWYN,
Director Geological Survey.

GEOLOGICAL SURVEY OFFICE,
MONTREAL, January, 1870.

A blank schedule was sent along with the above, containing the following questions:—

Name in full. Mine or other description of property worked. Name of and distance from nearest town, railway station, or port. Cost and mode of conveyance.

Names of owners, or of company and manager.

Nature of tenure and particulars of terms (rent, royalty, &c.)

Total depth of mine. Names, average thickness, depth and number of seams, beds or veins.

Number, dimensions and depths, of shafts and stopes, and total length and dimensions of galleries, levels, drives or other excavations.

Total area worked, in acres, cubic yards or feet.

Dates when discovered, first worked, suspended and cause, and re-opened.

Number of hands employed, men and boys; total number of days work. Miners or quarrymen, mechanics, bankmen, labourers; whether by contract, day-work or tribute.

Average rate of wages, or earnings of each class.

Number of horses employed in the mine, and on the surface.

Number, H.P., and kind of engines in the mine, and on the surface; also, whims, whips, cranes, stamp mills, crushing rollers and pumps; whether worked by steam, water, wind or otherwise.

Total cost or estimated value of fixed machinery; also, of rolling stock or plant.

Total quantity sold. Total value, and price per at the works or delivered.

Quantity used on the works. Quantity on hand on 1st January, 18 , and quantity on hand 31st December, 18 , from previous years.

Total quantity crushed, reduced or otherwise treated. Produce, per and process used.

Destination of produce. Provinces, neighbouring States and foreign countries.

It is very desirable that plans and sections of the Mine, accurately drawn to scale, and showing surface and underground works, should, if possible, accompany the returns. After the first year the annual additions only would need to be given.

This was entirely my own suggestion, except one question from Mr. Hartley. This document frightened people; it had the look of prospective taxation, and as if a royalty was to be exacted from the miners. It had too much of the authoritative style about it, and it was not successful; but after about three years working of it, Mr. Robb was instructed to take the information collected—I suppose I got about nine-tenths of the information myself—and compile a statement from it. These statistics appear on page 146 of the Report for 1871-72. In Great Britain, experience had taught gentlemen in charge of mining surveys, to make the questions as simple and as brief as possible, and I have some circulars here, accompanied by questions, which were sent out by Mr. Hunt, Keeper of Mining Records. There were only a few questions attached to each circular. The following are samples of the questions asked:

Circular No. 1

(1.) Name and situation of iron works.
(2.) Owners of iron works.
(3.) Number of blast furnaces.
(4.) Number of furnaces in blast during the year 187 .
(5.) Quantity of statute tons of pig iron, made in 187 .
(6.) Quantities and descriptions of iron ore used in 187 .
(7.) Number of puddling furnaces.
(8.) Number of rolling mills.
(9.) Number and capacity of Bessemer converters, if any.
(10.) Particulars relating to the character of iron ore used, and whether raised or purchased, will be valuable.

Circular No. 2.

(1.) Name of mine.
(2.) Situation of mine.
(3.) Name of company or individual working the mine.
(4.) Name of secretary and purser.
(5.) Name of manager or chief agent.
(6.) The description of ore or ores raised.
(7.) The quantity of each description of ore raised in the year 187 .
(8.) General remarks on the character of the mine and minerals raised.

Circular No. 3.

(1.) Name and situation of the colliery or collieries.
(2.) Name of the owner, or of the firm working the same.
(3.) Quantities of coal raised and sold or used in 187 .
(4.) Quantity of slack raised and sold or used in 187 .
(5.) Description of coal produced.
(6.) Prices at which the coal and slack were sold at the pit bank.
(7.) Any information as to the distribution of the coal will be valuable.

Circular No. 4.

(1.) Name of the works.
(2.) Name of firm, and postal address.
(3.) Number of boxes of tin and of tin plates made in 187 .
(4.) Number of black plate made and sold ready for tinning in 187 .
(5.) What was the actual weight of the whole.
(6.) General remarks on the manufacture.

These answers were filled up, and a general compilation of mining statistics collected in this way. Since the Survey has stopped collecting these statistics, I have carried on the work privately, and have the returns up to the present year, which are ready for publication if they are considered of value.

Q. You say you have collected these statistics privately?—Yes.

Q. Have they been furnished to the Department?—No; as I had no encouragement to furnish them. I requested Dr. Selwyn to allow me to go to the mines, but he refused his consent, and I therefore collected these statistics privately.

Q. And are you still doing it?—Yes; I have them up to date. I thought it was a pity to let the record be lost, because we could never have got it again; I have spent some time in compiling these statistics, and they are now pretty much in shape, to be published as a book to be called "The Mineral Resources of Canada; an Account of the Economic Geology of the Dominion, and of the Progress of Mining during the last Twenty Years."

Q. Did you find any trouble in getting from the owners and managers of mines the information necessary for such work?—Not at all. There is no difficulty in getting such information from them when they are properly approached. Sometimes there is some delay in getting the returns, but on visiting the mines you can always get the fullest particulars, and in case of any negligence to fill them up, you can do it yourself, on the spot. In fact, the only way to collect them properly is to do so yourself.

Q. Did you have any difficulty, on visiting the mines, in obtaining the necessary information and data of our mineral produce?—Mining men are like others in this country; they are generally obliging and civil in giving information. I do not consider it necessary to employ highly-paid experts to do this work; nor do I think school-boys in their holidays could collect these statistics. I should think, therefore, that the gentlemen already on the staff are fully competent to do so. Many of the geologists on the staff could not only collect those statistics, but could give valuable advice to the miners.

Q. Do you think that attention to mining statistics would entail much additional expense on the Survey?—A very slight addition; perhaps travelling expenses, and it might require the time of one man during the winter to compile them. It might also take a little of the time of those amongst us who are best qualified to give advice to mining men, which would be valuable, as being disinterested.

Q. An impression prevails that the work of the Survey is not commensurate with its expense, and that these defects result principally from the system under which the Survey is conducted, or from its administration under that system, or both, and the Committee would be glad of your views on this subject?—I am not at all responsible for the administration of the Survey in any respect, because I am never consulted and, therefore, if any blame is supposed to be attached to me personally, I repudiate it, but I will say that the results are not what might be expected in proportion to the expenditure.

Q. Is the defect in the system, or is it the administration under that system? —The only way, perhaps, to bear out what I say, would be to compare our results with those of other Surveys. For instance, in the State of Pennsylvania, a survey was begun in 1874 and nearly completed in 1880, but is still going on in a small way. Most of the results of the investigation, however, came within that period, and up to the present time no fewer than fifty-three volumes of reports and seven atlases, embracing about 10,000 pages of reports, in which are found 1,000 plates, cuts, and other illustrations, and 100 maps have been published. The expense was about $50,000 a year, not much more than one-half of what we are spending, and the Director considers it ample; he did not wish any more, and said, although he was offered more money, that it was sufficient to carry on the work as fast as he could superintend it. In comparison, I might cite the results of other Surveys, such as the Survey of the United States, and those of France, Italy, Spain, Germany, Norway and Sweden, and also of India. Our own reports vary from 200 or 300, to about 500 pages, and one such volume a year. In Pennsylvania they have had fifty-three reports in ten years,

while we have had about six reports, each containing pretty nearly the same amount of matter, but ours are different from theirs. Their reports are of practical utility, while ours are not so, to a great extent. Some of our reports are no doubt useful, but a great part of some of them is taken up with journals of camp occurrences, and would not be read or sold at all if published as private books. I might mention that the Director's own reports since he came to the Survey, about fourteen years ago, consist of 146 pages of summary business reports, stating what others have done, changes in the staff, &c.; 293 pages of journals of travel, and the last five reports contain only thirty-two pages in all relating to geological work proper, part of these, however, being quotations from the reports of other gentlemen which had been suppressed.

Q. Does the responsibility rest solely on the Director? Does he determine what is to be published? Does he lay out the field of labor and assign the different sections to the various members of the staff?—Yes, I understand that latterly he has been asked to lay before the Government a statement of what he proposes to do, and this, as a matter of course, is approved of and carried out. He never consults with me, but I suppose he consults with somebody. I do not know anything about that.

Q. Supposing he wished to divert the attention of the staff under him to the collection of mineral statistics, and to report on actual mining operations that are going on, is it quite in his province to do so?—Yes; I have heard him say that the interference of the Government is merely nominal. The Government are not supposed to do what should be done, without advice; if they employ an expert to do this, they probably allow him to have his own way.

Q. Without referring to the *personnel* of the staff, or to the selections of the subordinates and their treatment by the head of the Survey, what is your opinion as to its efficiency?—The members of the staff are, as a rule, I believe, capable men, and with fair opportunities would do much better work than they are doing. Opportunity is everything; for instance, if a man has an appropriate field to go to and is given the proper means of carrying out his work, he may accomplish much, but if he is systematically discouraged and deprived of the means of carrying out his work, he will accomplish very little, and then if his reports are suppressed or unduly curtailed, the public are in utter ignorance of his work, his name not even being mentioned in the report.

By Mr. Cameron:

Q. Is the Director of the Survey responsible for the suppression of names?—Yes; he has suppressed the names of many who have sent in reports.

By Mr. Baker.

Q. Is the systematic discouragement active or passive?—It is active, amounting, I may say, almost to persecution; I know it amounts to such in my own case.

By Mr. Wood.

Q. Can you give us any idea of the nature of those reports which are suppressed?—I can give you an idea of reports, such as my own, of experienced geologists in the Eastern Townships and elsewhere, which were duly sent in each year, but which have never seen the light.

Q. What sort of information did these reports contain?—Information in regard to the work done with reference to the geology of the country, and perhaps what is proposed to be done, and also, in some cases, interesting information with reference to the economic minerals.

By Mr. Cameron:

Q. I believe there has been no report of Cape Breton published since 1881?—I am aware that Mr. Fletcher, who is, I may say, one of the best geologist we have, certainly one of the most painstaking and capable geologists, and a man of experience and systematic training, made a very valuable report on one of his recent surveys, which was accompanied by a map, giving a very detailed account of the geology of Cape Breton. The Director said the report could not be published as the map was not engraved; the map was all ready, and still the report is not published.

Q. How long is it since the map was ready?—I think about two years; it was got ready as quickly as possible.

Q. Have you any idea of the importance of that district?—Yes; I believe that it is very important. Mr. Fletcher himself has said so repeatedly. But, I may say, that I am not thoroughly aware of what is being done, as I am never consulted.

Q. You are quite sure that the report and maps could have been published?—Yes.

Q. Do you know anything about the suppression of Sir William Logan's report with reference to the work of the last years of his life?—I am aware that all the reports of the Survey, from 1858 to 1863, have disappeared. I have seen them myself in the old office in Montreal, the manuscripts which were piled up being nearly a foot high.

By Mr. Dawson:

Q. Were these all reports of Sir William Logan?—Some of them were my own.

Q. When did you last see these manuscripts?—They were on Sir William Logan's shelves and, as they wanted to make a partition across the room, this material was all cleared out, and since then there is no trace of them to be found.

Q. Who was the custodian of these documents?—They were in Sir William Logan's custody until he gave them to Dr. Selwyn. I dare say Sir William handed him all the reports and maps.

Q. You are sure you saw those reports there?—Yes.

Q. Did you ever notice these remarks of Mr. Thomas McFarlane, which he has published about Sir William Logan:—"If laborious and painstaking study of the actual stratigraphy in the field is to count for anything, it is no discredit to Mr. Selwyn to say that his work in this respect is far outweighted by that performed by Sir William. Further, we all know that the closing years of his life, even after his official connection with the Survey ceased, were devoted to a re-examination of the Eastern Township rocks, and to the completion of his map. Surely all this ought not to be thrown aside as useless work. Surely Sir William, had he lived, would have had something to say in these days in defence of his opinions. Although he is gone from us, it is surely our duty to take care that justice is done him, and I contend that it would only be an act of simple justice to his memory to give to the world the results of his labours, just in the shape which they attained at his death. Apart altogether from his theoretical conclusions, the correctness of which Mr. Selwyn disputes, the observations of Sir William and his assistants, as to the actual phenomena exhibited by the rocks of south-eastern Quebec, have a practical value to the country and to all future observers, which I conceive it to be the duty of the Survey to put on record. When we consider the very slender foundation of new material upon which Mr. Selwyn's views regarding the Quebec groups are built, it would seem that the conclusions which he has arrived at are, to a very large extent, theoretical, and therefore just as little entitled to immediate acceptance as those of others who have written on the subject." There, you see, it is distinctly stated that some of Sir William Logan's writings have been suppressed?—Yes; I think the work of Sir William Logan's last years, which was a volunteer sort of work, at his own expense, in the Eastern Townships and the adjoining States, has been suppressed; it took the form rather of maps, which have been suppressed up to this time. Mr. Selwyn has said that there was not a line on them correct, but Sir William was a good draughtsman and surveyor, and very painstaking in everything he did. I know, for instance, when he was working in the Eastern Townships, that he spent two years in one township, namely Danville.

Q. And is the result of these two years' work now in the office of the Geological Survey?—Yes; at the time Sir William retired, he left maps of probably ten or fifteen years of his own work, and also of that of Mr. Richardson and of part of that time of Dr. Hunt, Mr. Murray and myself. This was subsequently supplemented by the work of Messrs. Webster and Weston, under the direction of Sir William Logan.

Q. Can you imagine any reason why these reports and maps should have been suppressed?—Well, Mr. Selwyn likes to put his own name on every piece of

paper. At the Philidelphia Exhibition he pasted a piece of paper over Sir William Logan'sname on the map exhibited by the Survey.

Q. I would infer that it was jealousy of his great predecessor?—It would appear to be so; at any rate, the officers of the Survey are strongly of opinion that it is only fair and just that this map should be published. By all means let us have the benefit of what we have done, and if any fault is to be found with it, Mr. Selwyn would then have an opportunity of expressing his views upon the subject. I might say, with regard to the map, that Dr. Selwyn has reduced the number of the lines, and claims he has simplified the map; but he has not simplified it, in my opinion, any more than he would simplify a fine portrait by whitewashing it. But, I suppose, he thought it would give him an excuse to put his own name on the map, instead of that of Sir William Logan, and it is thus published by two publishers—Dawson Bros., in Montreal, and Walker & Miles, of Toronto. These maps show nothing but the divisions and sub-divisions of the land into the townships, seigniories and lots.

Q. Then he has taken credit for the work of the Crown Lands Department?—The map is simply a topographical map. I see it says it is the work of the Geological corps, which is not true.

Q. So that he exhibits the map as being the work of the Geologicial Survey, while it is, in reality, the work of other Departments?—Yes, the work of the Crown Lands Department.

Q. Did not the Geological Survey contribute part of the expense of the re-examination of the Eastern Townships by Sir William Logan?—Yes; Mr. Webster was paid by the Department, and acted as Sir William's assistant.

Q. So that the Survey had a pecuniary interest in the work?—Yes, Sir William Logan intended it as part of the report.

By Mr. Baker:

Q. Amongst scientific men, what is the usual name for an act of misrepresentation by putting your name to other persons' documents?—I think it is called literary piracy. If the same disposition to give credit to everybody, which was exhibited by Sir William Logan, prevailed, there would be more encouragement to members of the staff to do their work efficiently. With reference to a former question, I may say, that my own reports on the Eastern Townships, and those of Messrs. Webster, Richardson, Ord, Weston, Brow and others, have all been suppressed.

Q. Have any of the reports of Dr. Dawson on British Columbia ever been suppressed or curtailed?—No. I may mention that I have been asked to get my reports into a dozen pages, and certainly not to exceed twenty.

Q. Simply to put you in the back ground I suppose, or on the score of economy?—To put me in the back ground, I believe; I was told that the cost of printing was too great to allow of their being published at length. I may say that Dr. Dawson presented a report of 239 pages, representing two and a-half months' work, mostly on Indians, and illustrated by fourteen plates and thirty-six figures, principally Indian gim-cracks, and the report itself was a disquisition on Indian dolls, potlatches, Indian dances, &c., which were not necessary. I admit that this may be valuable information, but it is inappropriate for publication in the report of a Geological Survey.

HOUSE OF COMMONS, 19th March, 1884.

The Select Committee on Geological Surveys met this morning, Mr. HALL in the Chair.

ROBERT BELL, Esq., C.E., M.D., LL.D., Assistant Director of the Geological and Natural History Survey of Canada, was again called and examined.

By the Chairman:

Q. Do you mean that those reports which have been entirely ignored have been embodied in the report of the Director without any reference as to who did the work?—They have not been printed at all.

Q. Was there no reference made to them ?—Scarcely any; the work may have been alluded to, in the small report published by Mr. Selwyn, the reports themselves not being printed at all. One of Mr. Webster's suppressed reports was largely devoted to the Chaudière gold fields. In speaking of the mines, I might say that Sir William Logan devoted a great deal of attention to the Chaudière gold fields and purchased specimens of the gold to illustrate the subject, at his own expense. He bought some £500 worth of gold, which he kept for some twenty years for the benefit of the public, to show the style of the gold and the abundance in which it had been found.

Q. Did he leave it with the Museum after his resignation ?—No; his executors sold it as not authorized to be given to the Museum. I mention this, as the subject of these gold fields came up yesterday, and I forgot to mention it in speaking of the great attention which Sir William Logan paid to mines.

Q. You have referred to the suppression of the report made by Sir William Logan upon the mining regions of the Eastern Townships. I would like all the information on that subject which is possible. I know there is a great deal of enquiry about these reports in that section of the country; it is known that Sir William spent some time after he resigned his connection with the Survey working in the Eastern Townships and he was aided by an officer of the Survey, showing that the Survey intended to be interested in that work, and yet there has never been anything to show for those years of labor ?—I think I mentioned yesterday that it took the form of maps rather than reports. I am aware that Sir William Logan maintained his views to the end, and that he worked as long as he was able to. Mr. Webster assisted him both at his own house and in the field. Dr. Selwyn says that at the last moment Sir William Logan told him that he had no faith in his map and did not wish to have it published, but this is at direct variance with what he told everybody else. I do not know why he should have made such a request, because he spoke to everybody freely about his views.

Q. There is no printed evidence of Sir William Logan having been dissatisfied or having at all doubted his conclusions as to his geology of the Eastern Townships ?—None, whatever. Dr. Selwyn was strongly of the same opinion as Sir William Logan up to the time of the latter's death, and disputed Dr. Hunt's views. After Sir William's death, he wrote to Dr. Hunt that he would have no objection to be converted, but he would have first to go to the field to have the foundation for his change of views, which he did the next summer.

Q. His views were completely changed ?—They were as completely changed as he had anticipated they would be.

Q. I understand that he adopted the view of Dr. Hunt, in contradiction to that of Sir William Logan ?—Yes; he opposed everything that Sir William Logan had said and done, and adopted those of Dr. Hunt; there was nothing new, therefore, in his views, but he simply adopted Dr. Hunt's views as being correct. This was with regard to the age of one of the divisions of the Quebec group; Sir William Logan considered certain rocks to be altered Quebec group, which Dr. Hunt said were older; that is, Dr. Hunt was of the opinion that the portion of the altered Quebec group was of an older geological date, but Sir William Logan thought it was an altered portion of the same formation.

By Mr. Wood:

Q. Are there no printed records, in any of the reports of the Survey, with reference to these different views ?—Yes; there is abundant evidence on these points.

Q. Can you refer to the reports where we can find them ?—Yes. Dr. Hunt's views were first given at the American Association for the Advancement of Science, at Springfield, Illinois, and the question has been very much debated by geologists since, and there are numerous essays printed, and papers have been read before Societies on the subject.

By the Chairman:

Q. Is there any reference, in the published report, to this work which Sir William Logan was doing during the last years of his life, and to the fact that he did

prepare a map?—I do not remember anything at all satisfactory and giving an honest account of the true state of that matter.

Q. Is there any reference to it, at all, since Sir William's death?—Yes; there is some slight reference in the report of the second year succeeding his death.

By Mr. Dawson:

Q. I think Dr. Selwyn refers to his views, with a view of combatting them?—Yes; and he has written several papers on the same question; the last one was published in the transactions of the Royal Society of Canada, having been read at the meeting in 1882.

Q. In effect to depreciate the work of his predecessor and advance his own?—He states, as a reason for showing why he should be taken as an authority on this subject, in preference to Sir William Logan, as follows:—"As I already stated, I commenced to investigate the structure of the Quebec group. I did so with the thirty-one years' experience in stratigraphical geology, chiefly among the ancient formations in Europe, Australia and America, and an amount of experience of palaeozoic and archaen geology, in time and space, which, probably, no other geologist on the continent could claim, Sir William Logan himself, not excepted."

Q. Sir William Logan continued to explore these rocks of the Quebec group for a long time after his connection with the Survey had ceased, did he not?—Yes; working in the Eastern Townships, and also in the States of Vermont and New Hampshire, and, I think, in Massachusetts, Connecticut and Maine.

Q. And these views have not been published, although quite accessible?—No; they may not have been prepared in proper shape for publication, but I think his views could be found on record and should be published.

Q. Dr. Selwyn, I believe, has published some of Sir William Logan's maps and taken credit for the whole work?—He has had copies colored and hung up about the office, but I think he hesitates to publish it. Sir William's geological map was quite complete and the lines were actually engraved on copper plate, and Sir William had colored a copy or two with his own hand. Sir William Logan's name was on the title of this map, which was dated 1868.

Q. Is that map printed and circulated?—The copper plates are in the hands of Stanford, the map engraver, of London.

By Mr. Wood:

Q. Could they not be brought here?—Yes; they might be sent for.

By the Chariman:

Q. There has never been any publicity given to that map?—No.

By Mr. Wood:

Q. Could we get all those reports of yours which were referred to yesterday, and which you say were suppressed?—My own reports have seldom been suppressed, but I have been instructed to make them short. The reports of several other gentlemen have, however, been suppressed. Mr. Fletcher's reports have been held back, and also those of Messrs. Webster, Ord, Weston, Vennor, Brown, Broad, Richardson, Dr. Honeyman, &c. I think the report of Mr. Fletcher, on Cape Breton of 1881, has been suppressed. Sometimes the title is a little misleading; for instance, my report for 1880 is represented as being for 1879-80, although my previous report was for 1879.

By Mr. Dawson:

Q. I see that we had a gentleman before the Hudson's Bay Committee yesterday who had been stationed there in the service of the Hudson's Bay Company within the last few years, and he said that the only really accurate map which we had of the country about the Moose River was the one published by Prof. Bell, in his report; that it was really a very good map and very accurate, so far as he could judge. Now, Dr. Selwyn criticizes the accuracy of Dr. Bell's map, giving as a reason for doing so, that he had received a letter from Dr. Rae who lived there some forty years ago, and Rae, in his letter, says:

"There are, or were in my day, two islands to the north-west of 'Inner Ship Hole' called the Ship Sands, and these islands were separated from the north-west

shore of the river by a deep and swift stream, which occupied about twenty minutes to paddle across in a canoe. Spring tides, aided by a gale, sometimes covered these islands with several feet of water. If the Moose River is as your map shows it to be, the islands where we camped must have been well inland, off the main shore of the left bank."

On November 20th, 1883, Dr. Rae again says:

"In reply to your enquiry, I must say that it is possible by some convulsion of nature, that the north branch of the river may have ceased to exist, but in the usual course of things such an event was not at all likely. You may make this north branch even wider than I showed it in the rough sketch I sent you, unless the Ship Sands have greatly increased in width."

Dr. Selwyn then says:—"In the map now published it will be observed that there is no north branch, and that the main shore of the left bank comes close out to the 'Inner Ship Hole' and includes the islands mentioned by Dr. Rae," and then adds. "It may be, however, that Dr. Rae's recollection of it, as it was forty years ago, and Dr. Bell's map of it, as it is now, are both correct."

Now, Dr. Selwyn qualified what he said by saying that, and Dr. Bell could probably give us some information about the manner of his surveys there. As I said before, this gentleman (Dr. Haydon) from Moose Factory, found his map the most accurate he had seen?—You might suppose that Dr. Rae had sent him these letters, unasked, but, on the contrary, he was asked to give these letters, and Dr Selwyn immediately seized the opportunity to make that statement of inaccuracy against me. When he is ready to admit that my map was accurate, it was unnecessary to say it was inaccurate. It was not done in the public interest. Mr. Dawson has requested me to give the history of it. The survey was made in the autumn of 1877, on my return from a long, successful and arduous expedition up the East-main coast. I was not called upon to make the survey at all, and it had no reference to the work of the season. Whilst my canoe was being prepared for the journey to Michipicoten I occupied my time in making this survey; I wished to do so, because it would utilize every hour of my time, as there was a good deal of expense attending the expeditions to these distant parts, and I expected that it might be useful in some way hereafter. It had no geological significance whatever. This map, I may say, remained in the office unnoticed for years and years, and it had been traced by anyone who wished to copy it; any of our maps might be had in the same way. In the autumn of 1882, Dr. Rae, who is a very old man, and who appears to be foolishly jealous of anyone who has anything to say in regard to arctic matters generally and in regard to Hudson's Bay in particular—he has been there, I may say, and therefore no one else has a right to speak of the subject—and as I presumed to say something upon it, he thought fit to put me down, in a lecture given in Winnipeg, in the autumn of 1882,and stated that this map was inaccurate. He stated in regard to the channel referred to in Dr. Selwyn's note, that it was two miles wide and very deep; this was published in his letter to the *Canadian Gazette* of London, of the 3rd May, 1883, but he has now reduced it to one mile. Dr. Selwyn's first duty was to ascertain whether the map was correct or not, but he would stop at nothing to injure me, so long as he kept within the law. Dr. Selwyn wrote to Dr. Rae for particulars about this map; he was aware of the existence of it for years, but he came to me one day, after having made a note of what Dr. Rae said, and asked to look at the map, and then suggested that it should be published. I said that it had no connection whatever with the report, and we had no excuse for dragging it into the next report. The map, however, was produced, and Dr. Selwyn had it reduced to half the scale. The original title of the map was "Plan of the Moose River, in the neighbourhood of Moose Factory, surveyed by Robt. Bell." Dr. Selwyn changed the title to "Plan of Moose River, from the neighbourhood of Moose Factory to James Bay." He could not see the necessity of changing the last line, thus making the map appear as a plan of James Bay, that not having been from actual survey like the rest. Great expidition was shown in engraving this map, and some 5,000 copies were struck off and piled up in the office, where they waited for many months until the rest of the report was ready. I had

been away all summer, and on my return Dr. Selwyn told me of his proposal to make a note about the inaccuracy of the map. I said it was his duty to find out whether it was correct or not, and not to accept the statement of a jealous old man like Dr. Rae, who was between 80 and 90 years of age, and could only speak from recollection for upwards of 40 years. I told him that my survey was certainly a good survey for the time spent upon it, and if there was a slight error he might suppress it, or if he thought that I had made a slight geographical mistake, it would be far better for him to accept my proof, if he wished to say anything about it. I wrote to two gentlemen who were quite well acquainted with the neighbourhood in question. One of them was Mr. E. B. Borron, a Stipendiary Magistrate, who had lived at Moose Factory for some years. Mr. Borron writes back to me, in a letter dated Collingwood, 20th December, 1883, as follows :—"As regards your map it has always been a suprise to me how carefully and accurately you have made your surveys and maps, considering the short time that it is possible for you to devote personally to that work. I never supposed that it was any part of your duty or that of any other geologist on the staff of the Geological Survey to make surveys and charts of such minute accuracy as would enable a ship to enter Moose River and drop anchor in the 'Inner Ship Hole.'" Further on he says: "There is no channel any further west than that you have laid down, that I know anything of," and still further: "Parson should know about the island, as well as any man, having been in the habit of sailing about in his Rob Roy canoe." I wrote to Mr. Parson, who was chief factor of the Hudson's Bay Company in charge of Moose Factory while I was there, he having been there some years before and also afterwards, and was quite competent to judge of its accuracy. He is now in charge of the Hudson's Bay house in Montreal. He returned the map, saying it was all right, and I asked him to write again, with particular reference to the point in question, to which he replied, under date of Montreal, 7th November, 1883, "I did not make any alteration or suggestion about the geographical features of your map, because I did not see any to make." Then I wrote to him again, asking him to find fault with it if he could, saying that I was much concerned about this charge of general inaccuracy, because it was calculated to do as much harm to a surveyor as it would be to a business man if he was called a thief, and if I could not disprove that statement I would be condemned as a surveyor. I was therefore anxious to show that even in this slight matter I was not inaccurate, and although it was a voluntary piece of work, which I need not have done at all. I had just crossed the sea from Fort George, 350 miles, sailing night and day in disagreeable weather, a voyage which had never been attempted before in a small open boat. I was entitled to a little rest, but immediately on my arrival I went to work. This last letter from Mr. Parson, which is dated Montreal, 11th March, 1884, reads as follows: "In reply to your letter in regard to your survey of the neighborhood of Moose Factory and the topographical features of that locality, as represented on the map in the last report of the Geological Survey, I beg to say that I was in charge of Moose Factory when you made the survey in the autumn of 1877. Having accompanied you during part of the time you were engaged in this work, I am aware that you made use of certain surveying instruments, stopping at numerous stations to do so, and taking great pains to make your observations. Your map gives a better idea of the mouth of Moose River and the neighborhood of Moose Factory than any other I have seen. I may add that I have also found your map of the route from Moose Factory to Michipicoten accurate, both as to distances and courses on the rivers and lakes, and also in regard to details as to rapids, portages, &c., &c., and have heard several people remark how useful they found it on their journeys." I also asked Dr. Haydon about it; he was physician and surgeon to the Hudson's Bay Company at Moose Factory for five years. He returned from Moose Factory and was up there until last autumn, going home by the last ship in October of last year, and of course while at Moose he had leisure to explore the neighborhood for miles around. He writes, on the subject, as follows:—

"OTTAWA, 17th March, 1884.

DEAR SIR,—Having seen in the papers that the accuracy of your map of the mouth of Moose River has been doubted, I take this opportunity of letting you know that it seems to me to be perfectly correct, and after a residence of five years at Moose Factory, I should have some right to judge.

"I am, Sir, yours truly,

"WALTON HAYDON, F.R.G.S."

I may also mention that Dr. Selwyn sent a man secretly up to the late Mr. Nason's friends, at Weston, to compare my map with any map which he might have left of his surveys in the neighborhood of Moose Factory. I happen to know that Mr. Nason's map confirms the accuracy of my own, and it was so reported to Dr. Selwyn, who has never seen fit to mention this circumstance to me, and probably does not know that I am aware of it.

Q. And has not given publicity to the information he has received?—No. I asked him to publish the letters of Mr. Borron and Mr. Parson, along with his statement of inaccuracy, but he pushed them away from him, and they would have gone into the scrap basket if I had not saved them. You can infer from these circumstances how far he desired to act fairly in this matter. At the second meeting of this Committee, the newspaper reports stated that Dr. Selwyn had said that I was very inaccurate and unreliable. I asked him the next morning if these reports conveyed a correct idea of what he had said, and he admitted they did, whereupon I immediately went into my room and wrote him the following letter:—

"GEOLOGICAL SURVEY OFFICE, "OTTAWA, 8th March, 1884.

"*Alfred R. C. Selwyn, &c., &c., Director Geological Survey:*

"SIR,—Having admitted to me this morning that you yesterday charged me before the Committee of the House of Commons on the Geological Survey, with inaccuracy in my reports and maps, I would now ask you, as I have the right to do, to point out in writing, specifically, where, from your own knowledge such inaccuracy is to be found.

"I have the honor to be, Sir, "Your obedient servant,

"ROBERT BELL."

Dr Selwyn also stated that he had mentioned the matter to the Minister. I told him that I had made surveys for twenty-five years, averaging probably 1,000 to 3,000 a year, amounting, in all, to 40,000 or 50,000 miles. Dr. Selwyn, in the letter which he wrote in reply to my note, said: "Sir,—In acknowledging your letter dated 7th March, which you have just handed me, I have to inform you, in reply, that the first sentence in it is wholly untrue. I never admitted having charged you with inaccuracy in your reports or maps, nor indeed have I ever done so. I have always treated your reports as accurate and reliable."

By Mr. Dawson:

Q. With reference to the report which was published for 1880-81-82, the result of three years' work, do you not think a larger issue could have been struck off of this volume?—Yes.

Q. We were informed that only 4,000 were struck off, and were only for sale in Montreal and Ottawa?—Yes; I believe that is the case.

Q. Should not the people of the several Provinces have an opportunity of becoming possessed of this valuable work?—Yes; I think a report which costs no more than that, if it is of any value to the country, should be distributed more largely. The great difficulty in getting them is that you have to buy them. Of course, having travelled a good deal in the various parts of the country, I am asked for these reports. On one occasion a gentleman asked me for a report, and I told Dr. Selwyn that this gentleman wanted to have a copy of my report, at the same time showing him a letter which the gentleman had written to me. Dr. Selwyn's reply was, that he could

not have it, and that he should write to him, as Director, for the report. The result was, as I am only allowed six copies of the report, that I had to buy one at $2.50 and send it to him, which I think I should not be called upon to do, out of my slender salary.

Q. Do you not think some evil may arise when officers of the Survey go about and make hasty reports on mines, their opinions being sure to carry weight, on account of their high position, and are these reports not calculated to do a great deal of harm?—Yes; most certainly. A man who occupies a responsible position, and whose work is taken as an authority, should be exceedingly cautious about making his statements.

Q. We had a mining company established at Michipicoten Island, on Lake Superior, and they had laid out about $250,000, but the Director of the Survey happened to go up there, and he said there was nothing in the appearence of the mine to justify the extensive buildings which had been put up, the machinery which had been put in, etc., and the effect of this was to destroy their credit in England, so that they could not get the necessary capital. They had practical men there, too, quite as likely to be able to speak of the quality of the ore as the members of the Geological Survey?—I am aware that Dr. Selwyn so reported in the summer of 1882, in regard to copper. I had also heard him say that he did not believe that there were any silver deposits in the neighborhood of Thunder Bay, with the exception of Silver Islet, which appeared to be worked out.

Q. Sir William Logan, in reporting upon the rocks of the Lake Superior region, described two groups of rocks, one the lower copper-bearing series and the other the the upper copper-bearing series, did he not?—Yes.

Q. Now, in the reports which are published, I see that these rocks, the upper copper bearing series, are sneeringly referred to by Dr. Selwyn as the so-called upper copper-bearing rocks?—Yes.

Q. I should fancy that Sir William Logan had paid a good deal of attention to the question before he gave out his opinion upon it, and I think he should be treated with a certain amount of respect?—Their place in the geological scale has not been determined yet, and at that time Sir William labored under great disadvantages, not having anything to compare them with.

Q. They have found no better name for them since?—None; we call them sometimes the Nipigon series for short, and to save repeating such a long name as the upper and lower divisions of the upper copper-bearing rocks.

Q. With regard to the coal of the North-West, according to the old theories of geologists and according to all the works published on geology, it was supposed that true coal belonged to the carboniferous period, and that it was immediately over the Devonian series?—Yes.

Q. This coal was of an entirely different series, in a horizon much higher than the carboniferous period?—Yes. The name carboniferous was given to this system of rocks, because it was pre-eminently a coal-bearing one, and notwithstanding that true coal is found in newer rocks, it is not generally found in any but the carboniferous; in fact, true coal in any formation but the carboniferous is somewhat exceptional.

Q. Until the discoveries in the North-West?—With regard to the coal of the North-West, most of it is not true bituminous coal. The border line between coal and lignite is not sharply defined.

Q. Is the Nanaimo coal lignite?—It approaches nearer to the true coal, although not quite identical. It may be more properly called true coal than lignite.

Q. According to the theory of geologists, formerly, true coal was not known to exist except in the carboniferous period?—Scarcely that; it was stated by geologists that true coal seldom existed elsewhere than in the carboniferous period, but the majority of coals newer than the carboniferous were of the nature of lignite.

By Mr. Halton:

Q. In your examination yesterday, you mentioned the names of several members of the staff who were discharged. I would now like you to state to the Committee

why it was that they were discharged?—The first on the list is Dr. Hunt, but as he is to be here himself, I will say nothing about him. Mr. Richardson was spoken of as having left the Survey; he was superannuated, but I think he would have been quite willing to remain, if matters had been a little more pleasant. Of course, in giving the reasons, I simply state my own recollection and what I have heard the gentlemen themselves say. Well, Mr. Richardson's willingness to leave, was the disagreeable treatment to which he had been subjected during the greater part of Dr. Selwyn's administration. He found that his own work, and also that of his great benefactor, was not only depreciated but sneered at, and he naturally did not like that. His reports were suppressed, the reason for it being, as Dr. Selwyn says, that they were unfit for publication, unless he had time to take the trouble of revising them. Sir William Logan, however, in his report of the geology of Canada, speaks of Mr. Richardson's reports as being really very valuable Mr. Richardson did not pretend to be a man of great literary attainments, but still he could write a very good report. Sir William says: "He requires aid in working up his materials in a report." Sir William always helped him with these reports, and they were published. Dr. Selwyn says it takes too much of his time to revise these reports, but Sir William took the pains to supervise them, and Mr. Richardson's reports were accordingly published. Mr. Richardson prepared a pamphlet, setting forth his wrongs. Mr. Webster's reports were also suppressed, although it was admitted he had done a great deal of excellent work.

Q. He was discharged from the Survey, I understand?—Not exactly; he was allowed to resign. Matters were made so disagreeable for him that he got leave of absence for some months, and during this leave of absence a general wish was expressed that he would come back, but he said that so long as Dr. Selwyn remained, if other means of living failed, he would not come back if he had a cartridge left to shoot himself with. Mr. Ord left, but as he is going to be before the Committee, he can give his own reasons. Mr. Broad was one of the best men the Survey ever had, but he received no assistance; he was, of course, at first a beginner, but a very promising young man. He, however, received no assistance from Dr. Selwyn to perfect him in his profession. His work was admittedly good, but, still after six years of hard labor, Dr. Selwyn knew scarcely anything of what he had done. Mr. Brown left because faith was not kept with him; he came here under certain promises as to pay and position, but shortly after his arrival a new man was placed over his head. He did very good service, but was not allowed to report, his work being scarcely mentioned. Mr. Brown left quietly, and was half way across the Atlantic Ocean before Dr. Selwyn knew he was gone. Mr. Vennor appears to have left because he had no prospect of getting on under Dr. Selwyn, and as his pay was small, he thought it would be better to leave. The Survey was about to remove from Montreal to Ottawa, and as his friends were in Montreal, and he saw no prospect of bettering himself on the Survey, he left. Dr. Spencer got no encouragement in pay, or prospect of promotion which he might earn, and was treated with no consideration at all, being continually nagged at, and so he left. He published the work which he did in Canada at his own expense, and it was afterwards published in connection with the Geological Survey of Pennsylvania, and also by the American Philosophical Society, and by the American Association for the Advancement of Science. Mr. Charles Molson, the gold medallist I spoke of, left on account of broken faith; he had no confidence in Dr. Selwyn, and did not approve of the rule or understanding at that time that every man who should not happen to be a gold medallist, or something of that kind, should not get promotion, and he did not think it fair that he should be promoted before other members of the staff without medals.

Q. Mr. Molson, you say, was a very clever and hard-working, pushing man?—Yes; he is occupied in mining.

Q. Is he still pursuing it?—Yes; in Colorado. Mr. Foord left because he got little credit for his labours, and his scientific productions, although published at the expense of the Survey, were represented in the introduction as not having the authority of the Survey. Dr. Harrington left, and although he did not say much

about his reasons, it was well known that he did not like the Director; his leaving had nothing to do with the removal of the Survey to Ottawa, as he left a considerable time before that took place. Mr. Alexander MacKenzie left because he had no confidence in the Director; he was denied any credit for the length of time he had served, and then, he was a mining man, and was not considered to be required on the Geological Survey. Mr. Robb's position was made very unpleasant for him; he was also very much nagged at; he had no confidence in the Director, and being a mining man, was not wanted. Mr. Grignard left because promises made to him had been broken, I believe principally with regard to his pay; when he left, he stated that the Director was no gentleman at all, and he would not stay with him. Mr. Matthew's reports, I believe, were not considered satisfactory; he could only give his vacation to the work, but there is no reason, that I know of, why he should not have continued to give it, the same as in the past. Prof. Bailey left, or was not asked to continue his work, on account of some disagreement with the Director, who did not consider him competent in some important particulars. He has been employed again during the past year, to go over Mr. Broad's work. Mr. Tyrrell was only temporarily left off the list of the Survey, owing to some misunderstanding on the part of Dr Selwyn, but his name was restored to the list. Mr. Scott Barlow once offered his resignation on account of broken promises and unpleasantness, but the matter was afterwards remedied, which admitted of his staying. Mr. Robert Barlow was superannuated, but would have stayed, I believe, willingly, had his skill been appreciated. He did not enjoy a very pleasant life in connection with his official position, and he could get no adequate increase in his pay, receiving about $50 as an increase, after some fifteen or twenty years' service. He was superannuated, but left dissatisfied. Mr. Coste is another whose leaving arose from broken promises; he was summarily suspended one day by the Director, and asked to write a letter of resignation, which he did, setting forth his reasons. He appears to have been employed without any understanding as to what his work would be, but was promised a definite salary, which he has never received. At the time he was induced to resign, he had no prospect of his qualifications as mining engineer being required, so that he might receive the position which he considered he was entitled to. Dr. Selwyn told him repeatedly that we had nothing to do with mines, and he was employed as junior draughtsman, his pay not being what his talents deserved. He was, however, taken back again. I might mention that some of these resignations took place before the staff of the Survey was properly on the Civil Service list, and it may be denied that these were members of the staff, but that is a very trivial technicality, as none of us were on the Civil Service list until a few years ago.

Q. What, in your opinion, are the scientific attainments which should be possessed by the Director of such a Survey as ours, in order to qualify him for the proper discharge of his duties?—I think the qualifications should be of a two-fold nature, professional and personal. With regard to the professional training, I should say, in these enlightened times, when educated men are abundant, that the Director should be a well educated man, especially in all departments of natural science, these being subservient to geology. Of course, geology requires a knowledge of some of them more than others. He should be a naturalist to some extent, a botanist, a palæontologist, and he should be a good chemist and mineralogist, and also have acknowledge of physics or natural philosophy. In a Survey such as ours, where there is so much pioneering work to be directed, he should have a knowledge of surveying, of mapping, and the use of instruments, some knowledge of astronomy being involved in all this. Personally, he should be a man of good common sense and gentlemanly bearing, with a good temper and disposition; and he should be industrious, giving all his time for the benefit of the Survey; in fact, to have all the ordinary qualifications necessary to deal with men and business matters.

Q. In your opinion, is the present Director possessed of all these qualifications? —I should hesitate very much to answer that question. I might be supposed to be actuated by feelings of retaliation, perhaps, for the events which have transpired about the question of my inaccuracy, but I am not at all vindictive or hot tempered,

and I should not be influenced very much about that particular circumstance. I think, however, from what I have said, you may infer that I have no very high opinion of the Director, with regard to either his professional or personal qualifications. I have had a good deal of intercourse with him, both in the field and in the office, and I have been subjected to a good deal of persecution.

Q. What are supposed to be the special work and duties of the Director?—He is supposed to superintend the work of all the officers of the Survey; to know what every man is doing, and to be able to guide, advise and assist him. These officers include not only the field geologists, but topographers, draughtsmen, chemists, mineralogists, paleontologists, and botanist and field naturalist. Prof. Macoun was understood to have the latter title, but it appears to have been taken away from him.

Q. Does the Director devote the whole of his time to the work of the Survey?—Well he attends the office pretty regularly, but I do not know what he is doing. He does not seem to know what the men are doing, or to know them even personally. He does not know some of those who have been there many years, when he meets them.

Q. Does he spend most of his time in Ottawa?—More than half of the whole year, I suppose, is spent in the office. He accompanied me once in the field, going with me from Lake Superior to the Red River; I think it was a great waste of time, as it was scarcely necessary for two officers of the Survey to try to do the same thing. His company was also excessively disagreeable, I might say intensely so. It kept my assistants and men always in hot water; some of them wanted to go back, and some of them did leave; but we came to an understanding with the others. My men did not understand his position, and his right to give contradictory orders; they were supposed to only obey the orders of the man who employed them and paid them. The trouble was his foolish interference with little affairs of the camp, and his nagging at the assistants and men. He did no geological work, that I am aware of. When he came home, he would not allow me to know what he was reporting on; he had the advantage of me, as he could know what I was doing. His report stated, that on his expedition to Red River, he was accompanied part of the way by Mr. Bell, and then went on to make some stupid remarks on my geological report.

By the Chairman:

Q. Is that report published?—Yes.

Q re his remarks on your report also published?—Yes.

Q. Which report is it?—It is the report for 1872.

By Mr Holton.

Q. Is it within your knowledge, that members of the staff undertake outside work, for private parties, receiving remuneration therefor?—Not that I am aware of. For my own part, I know that Sir William Logan, at the very first, instructed all the officers to avoid any outside work, and especially in regard to mines. Of course, they might be allowed to invest their money if they had any in any way they liked, but, it was understood, that they were to have nothing to do with mines, except in their official capacity, and, as far as I know, I believe they adhered to that rule; I did, except, during a short period that I was entirely disconnected with the Survey, and when I returned, Sir William made the stipulation, that I should never have anything to do with any mining property. I undertook to make such an engagement, and I have kept it up to this moment.

Q. I do not refer to that so much as to members of the staff being employed by private parties to report on mines, for instance, and receive remuneration for it. Is there no regulation prohibiting it?—I am not aware of any direct regulation, but I should think it should be forbidden, and should not be done.

Q. You cannot say whether it is done or not?—I am not aware of any instance just now. There have been rumors, of course, of parties having a certain interest in performing this sort of work, but I have no personal knowledge of it.

Q. Is it part of the work of the Survey, as at present conducted, to preserve records of the mineral resources of the country, or of the mining development of the country, or statistics of any kind?—No such records are kept officially.

Q. What is your opinion of the value of mineral statistics? Could such be gathered, preserved and published, as is done by the United States Geological Survey, by the present staff, and without any great additional expense ?—I consider that the collection of mining statistics and records of all sorts should form a very important part of the duties of the Geological Survey.

Q. You are acquainted, I presume, with the methods pursued by the United States Geological Survey, in connection with this?—Yes, and also with the methods pursued in Great Britain, both from published accunts and from personal interviews with the Keeper of the Records, Mr. Robert Hunt.

Q. Could such a work be undertaken by the staff of the Survey, as at present constituted, or would a heavy additional expense be necessary to obtain mining statistics?—They might be collected by the present staff, with very little, if any, additional expenditure. It might be an expenditure of time in a different way from what we spend it now, but with, perhaps, no additional expense. The present staff is quite competent to collect these statistics. We have, of course, a number of men better qualified in regard to mines than others. We have one mining engineer connected with the Survey and another lately left, and some of the field geologists have a special knowledge of mines as well. It has been part of Mr. Fletcher's duty to examine coal mines, and before he came to the Survey he had been engaged in mining; he was well acquainted with copper and gold mining. I have also some knowledge of mining.

Q. What is the present condition of the Museum? Is it as extensive or as rich in valuable specimens as it ought to be after forty-two years of labor and expenditure? Has its growth been in proportion to the increased annual expenditure upon the Survey?—The condition of the Museum is very good, as far as the labelling and general arrangement goes. As to its value, I think it is not as valuable a Museum as might be obtained by the same expenditure of money. It has not grown at all in proportion to the increased expenditure and the number of officers connected with the Survey. A large proportion of the valuable specimens have been distributed after having been shown at the large exhibitions, and those which are left do not equal those which have been taken away. We have had great collections made for International Exhibitions, which should have been retained I quite agree with the plan of giving away cumbersome duplicates, but a large number of those which have been given away should have been retained. Very little is added annually to the Museum, and its intrinsic value is not very great, after such a length of time and such a large expenditure in connection with the Survey. You will understand that the formation of a Museum is not our principal object; it is incidental, but in some cases we might increase it much more rapidly than has been done.

Q. I understood that Sir William Logan bequeathed to the Survey books and instruments to the value of $17,000. Have they been received by the Survey, and where are they now?—We have a few books and instruments, but not many, in the possession of the Survey. The instruments were valued by Mr. Ross, an instrument maker in Montreal, and those of any value to the Survey were bought, but not all.

Q. I understand they were bequeathed to the Survey?—No; Sir William, in his lifetime, allowed them to be used, but there was no bequest of any books or instruments that I know of.

Q. Is the Survey, on the whole, economically managed? Is there any sign of waste?—I think, upon the whole, the expenditure is about as economical as in Government Departments generally, that is to say, when a man is promised so much and gets it, you cannot give him less, and certain supplies have to be paid for, but in some respects I think there has been a waste of money.

Q In what respect? To what do you refer?—One point which occurs to me is the boring operations, which have been carried on in the North-West Territories.

Q. When was that?—They commenced in 1873, and have been continued until two or three years ago, at intervals.

Q. Briefly, what are the circumstances?—Well, it was pretty well understood about that time (1873) that lignite or coal was to be found in the plain of the North-

West, among the clayey and marly sub-strata of the Cretaceous and Tertiary periods, and it was considered desirable to penetrate these, and find out where coal or lignite existed. It was first decided to make the borings with diamond drills; when I heard of this proposal I asked Dr. Selwyn not to adopt it, as diamond drills were not suited to that class of work. I had had some knowledge of them in boring petroleum wells. He was evidently struck by my arguments, and promised to refer the matter to a gentleman in town. I do not know whether he intended to be guided by the advice or not; at all events, he went to New York and bought a diamond drill, with steam engine and also horse-power, which were forwarded in great haste by express to Winnipeg, at so much a pound. It was found that they would not fit together, and the horse-power which had been sent up was found to be of no use; in fact, it was left, and I suppose remains to the present day just where it was unloaded from the steamboat, at the mouth of the Assiniboine River. The gentleman who was placed in charge of this boring seemed to have no knowledge of it; at any rate, with an unsuitable machine, and with no special knowledge of the work, the drilling was an expensive failure. These operations were continued by two parties the following year, and were again expensive failures. In 1875 another boring party was sent up, and was intended for the Battle River, but ended by boring a hole in the back yard of the enclosure of the Hudson's Bay Post at Fort Carlton, and finally there was some borings by contract, but not with the diamond drill, I think. Then there were some borings about the Souris country, two or three years ago, but although that was successful, as far as boring the holes were concerned, it resulted in nothing of any practical value. Four holes were bored, and in one case a seam of lignite was struck, but it was within a mile of the natural outcrop of the seam, and would be of no more value than boring through a pile of planks to ascertain the existence of a plank at the bottom, instead of looking at the edge.

Q. Can you estimate the loss to the country by these failures?—If the carrying out of these operations was supposed to be of any practical value, we have lost the benefit by their not being carried out, and then the direct loss of money was pretty serious. These operations were begun ten years ago, and we have no result yet, and if any result was desirable, we have lost the opportunity.

Q. Were these experiments, in your opinion, necessary?—Not necessary, but if they had been successfully carried out, they would have added valuable information about the geology of the country.

Q. What, in your opinion, is the present status of the Survey in the scientific world? Is it as high as formerly? If not, how do you account for its decline?—I scarcely think it is as high. Of course, we live on the traditions of the past, and our good name has not gone altogether I hope, but I believe the Survey has rather gone back. We have not retained the reputation which we certainly ought to have, in proportion to the expenditure. When I was last in England, in conversation with Prof. Huxley, for example, I found out that he did not know who the present Director was. The names of Logan, Billings and Hunt were household words, but he did not know who the present Director was.

Q. In your opinion, is the Survey at present accomplishing any practical good for the country? If not, why not?—I think it is. The value of our surveys, if the public can consider them accurate, alone, amounts to something. These topographical surveys are valuable, supposing no geological work had been done at all. If our own officers cry them down, I do not think they will be considered of much value hereafter. The geological work also, as far as it goes, is valuable. The general information we obtain in regard to the country, in the more distant expeditions, gives us an insight into the resources of these distant regions, which is always valuable to the men in charge of the country in planning our destinies, and also valuable to those who go in advance of the others to settle the country. The more minute work, such as that done by Messrs. Fletcher and Ells, the chemical and palæontological work done at headquarters, and the botanical work, are all valuable.

Q. Is it your opinion that the usefulness of the Survey could be increased, and if so, in what way?—I think its usefulness could be increased, by giving a more

practical character to the observations of the Survey; by having it devoted, mainly, to the mineral resources of the Dominion. I should also say, that an increase in the relative strength of the field officers, as compared with those in the house, would be advantageous. The field staff, I think, has increased little or nothing, during the last ten years. I should think that general explorations of our great unknown territories might be made, which would embrace a variety of subjects besides geology. Geology should be one of the primary points, but we should also get a knowledge of the topography, the soil, the timber, &c.; such information, for instance, as that procured by Prof. Macoun, before he joined the Survey. Another class of field operations should be more thorough geological work, in the old and more settled portions of the Dominion especially such as give promise of mineral wealth. I consider that a new Geology of Canada should be prepared similar, in its scope, to that prepared by Sir William Logan in 1863. I think more satisfactory information could be secured, by selecting men for positions on the staff, according to their qualifications and experience, because. in geology, the value of the information depends on the experience of the man who furnishes it. If the Geological Survey is also to be a Natural History Survey, it might be as well to have a qualified entomologist and icthyologist. These would, perhaps, be most useful departments. We have a botanist, as you are no doubt aware. He is a master in the subject, and a very competent man in every way. Then, it is found impossible for one chemist and one palæontologist to do all the work of this vast country; and part of the work of these departments might be given out to specialists abroad. It is impossible for a palæntologist to change from one subject to another, and we could get quicker results, and probably others would have more confidence in them, if we were to give some of the work to specialists in these departments. The reports should also be published, as soon as ready, and these should be very widely circulated. Separate reports on the different subjects should also be distributed to those who require them; a man should not have to take a whole volume in order to get the subject he wants. Then a number of these should be bound together, in cloth covers, instead of paper, for presentation to the several public libraries, colleges and other similar institutions, in various parts of the country. One other improvement is this—as the troubles in the Survey have arisen from certain defects on the part of the Director, I think, some means of correcting them should be found. The Director of the Survey should be a man of some dignity, and one whose word could be relied upon by the subordinates, in all cases. I have found no difficulty in managing men myself, by simply making no promises but those I intended to fulfil, and fulfilling them to the letter. White men, such as geologists, are very easily dealt with indeed, my experience has been, among Indians and others that I have employed in the field, that by keeping my word they have been very amenable to discipline. Indians, as you are doubtless aware, are, perhaps, the most difficult to manage, in the field and out of it, and yet, out of the hundreds of Indians that I have employed, I do not know of one who would not be willing to go with me again. I have had one Indian with me for nine years in succession, and others for five or six years, and not by any particular favours either; I made them work hard and do their duty, but I kept my promises to them.

Q. Am I to assume that you would like to recommend the appointment of a more efficient Director?—I should very much prefer not to make a recommendation on that point. Of course, the Committee, after getting all the evidence, will be in as good a position as myself, and I think it would be unbecoming in me to make any recommendation on that head.

Q. I would like to ask you if, as a rule, competent men can be found in Canada and amongst the Canadians for the various positions on the staff of the Survey?—I should say pre-eminently more so in Canada than anywhere else could we find the proper men. I have a good reason for saying so. A Canadian who is employed even as a mapper or draughtsman is worth much more than a new-comer from a foreign country, as they have a clearer understanding of the geography of the country, and and are more versatile than the ordinary class of immigrants that we get from the old country, mechanically, as well as in other respects. For my own part, I am not

ashamed of being a Canadian, and I think we have no reason to be ashamed of our record when coming into competition with other people. We have given an inspector of mines to the south of England—Mr. Frechville. We have given lessons in geology and in coal mining, in regard to tracing out coal districts, to English geologists, and Sir William Logan was a Canadian. Sir William mapped out the coal fields of Wales in a way that could not be improved upon by any Geological Survey. Mr. Billings was a Canadian, and he was considered a master in his subject, his opinions commanding the greatest respect as an original thinker, palæontologist and naturalist throughout the world; he taught many lessons to English people on these subjects.

Q Is it your opinion that Canadians are less amenable to discipline than Englishmen?—Not at all. I have seen no case where they were not amenable to discipline; certainly, the gentlemen in the Geological Survey have not shown the slightest disposition to resist discipline, even those who are complained of, such as Mr. Fletcher and myself. I do not think the slightest want of discipline can be charged against us; neither Mr. Fletcher nor I have ever refused to go anywhere we have been ordered, nor offered the slightest insubordination, and this, in spite of a good deal of persecution. I believe the Director thinks any of the members of the staff have no more right to speak to him than the privates to the general in the army. I know, in my own case, when I have attempted to remonstrate with him, I have been told that he would not discuss matters with me.

Q. Are there not several scientific schools in Canada?—Yes; I might mention the School of Practical Science in connection with the University of Toronto, the Ecole Polytechnique, in Montreal, and the School of Applied Science in connection with McGill University. The Geological Survey itself should be a pretty good school for specialists in our own line. There is a School of Mines in connection with the Geological Survey of Great Britain, but what I have seen of the men who have come from it, I do not think are superior to the men produced in Canada. On an average, I have seen very few as competent men as we can turn out.

Q. It is your opinion then, that young men can be and are being sufficiently trained in these schools for scientific work?—Yes, I think so. The great ultimate training is entirely a matter of practice but to give them the necessary training to start this work is well done in these schools in Canada.

Q. You are perhaps aware that during the past year or two there have been, from time to time, very severe reflections upon the Survey published in the press. Did you in any way inspire these articles, or are you in any way responsible for them?—I have neither written nor inspired any of them. I knew nothing about them, with the exception of one that came out in the *Mail*, and for which an officer of the Survey was suspended. I was not aware that such a letter was going to be written or had been written until it was published, and I did not know who wrote it until the author was made public.

Q. It is within my knowledge that these editorials or letters have been attributed to members of the staff, and I asked this question, as I shall do to others, to give them an opportunity of exonerating themselvss?—For my own part, I have never written nor inspired any of them, either last year or this, and I am not aware of any one being inspired, except the one I referred to, and the gentleman who wrote it did not suppose that he was transgressing any rules; he was simply defending himself against statements which had been published concerning him and other geologists, and he thought he was doing his duty in informing the editor of the paper of his views upon the matter. That is the true state of affairs in regard to that case. But when he was told that he should not have done so, he bowed to the will of the Minister; he was severely reprimanded, and when he read near the end he trembled for his fate; he did not know whether he was to be hanged, exiled or imprisoned for life; and it ended by saying that the pleasure of the Minister was that he should be suspended for a fortnight. He was rather relieved that the sentence was no worse than that, although he thought it was severe enough. In connection with the question of my general accuracy, I merely submitted the opinions of certain gentlemen on the particular point that had been raised. I had intended, also, to submit a number

of testimonials, which I received from ten to twenty years ago, from the highest authorities, such as Sir William Logan, Prof. Chapman, of Toronto; Prof. Geikie, of the Geological Survey of Great Britain; Prof. Baird, of the Smithsonian Institution; Prof. Allan Nicholson, late of the Toronto University, and perhaps twenty others, all referring to the great care and general accuracy with which I was accustomed to make my reports.

By Mr. Baker:

Q. It has been stated in the evidence already given that the Survey is conducted under the Dominion Act of 1877. Is that so?—As far as I am aware, it is. It is the last Act in regard to the Survey constituting it the Geological and Natural History Survey of Canada, instead of the Geological Survey, as it formerly was.

Q. Previous to your going into the field to work in any of the Provinces, are you furnished with any specific instructions in writing by the Director?—For my own part I only remember receiving written instructions on two occasions. Sir William Logan never gave written instructions to me or to any other member of the Survey.

Q. Are written instructions given to other assistant Directors, or are they merely verbal?—I am not aware, but there may be. There are certrin rules and instructions in regard to the method of keeping the note books and labelling specimens, which are standing rules. These have been submitted in writing; every officer going into the field gets a copy of the same rules.

Q. Would not much time be saved if topographical surveys were made, irrespective of the geological, and previous to the geological survey being made?—A rule which would apply to one country might not apply to another. We have to consider the special conditions, and no general rule will apply. I do not think, as a rule, that it would be practical to make topographical surveys independent of the geological, and if it were it would be cumbersome and expensive.

Q. Are the general outlines of the topographical maps made by the Department of Dominion Lands a good and sufficient guide for the purposes of a geological survey?—Where they are based on any kind of survey they may be so considered; we could improve them here and there, but any maps that exist of distant parts of the country that have not been surveyed are not sufficient for geological purposes.

Q. Would not much time be saved by the previous existence of maps that would be a sufficient guide?—Yes; much time would be saved, but it would, as a rule, cost more than it was worth, to send a topographical party ahead of the geological one, for that purpose. Well qualified men, such as many of those who have left the Survey, are capable of making surveys simultaneously, without any loss of time. For my own part, I have made the surveys, and done the geological work as quickly as two men separately would do it. When you arrive at a station, you may also take a few minutes for taking a topographical observation, sufficicent for our purpose.

Q. Do you hold the opinion that Canadians know less about geographical matters than do the Irish, Scotch, English or American?—I think, as a rule, Canadians are better geographers, with regard to, not only their own country, but of other countries. The reason is, that maps are very common in this country; you see them hung up in railway stations, offices, hotels and most houses; in fact, everywhere; and we read in the papers of the geographical development of the country, and know more about the counties and natural divisions than most people.

Q. Then, you are of the opinion, that young Canadians are better adapted, provided they are properly trained, than those of any other country, for work on the Geological Survey?—Yes; infinitely better.

Q. If you had the exclusive right of selecting your assistants, you would select them from Canadians in preference?—Yes; but if I had the responsibility of performing a certain amount of work, I would not select a man solely because he was a Canadian, but I would give him the preference over a man of equal training; for people of other countries never give us any advantage over themselves, and I do not see why we should do so for them.

Q. You believe in Canada for the Canadians?—Yes.

Q. Do you think it would be advisable for the Director of the Geological Survey, be he who he may, to have absolute power in the selection of his staff?—Certainly not; that would be a dangerous power in any man's hands.

Q. Do you not think that political influence, or the mere fact of its being a branch of the Civil Service, is detrimental to the work and to the welfare of the Department? —Any interference might, or might not, be detrimental; but I think it is essential that the gentleman managing the Survey should be responsible to the people of the country, rather than to have an autocrat, who would discharge according to his likes and dislikes. A man should be promoted according to his skill and seniority.

Q. You are of opinion, then, that the position and status of the assistant directors should be properly defined?—Yes.

Q. And that promotion should be made according to seniority?—Not exclusively on that ground; but seniority should be considered, other things being equal. It should be no disqualification to a man that he has been a long time in office, if he is not lazy, or too old, or otherwise incapacitated. It is no encouragement to a man, after he has spent many years in the service, to have a young man put over his head. Even if the latter had some little advantage, I think that seniority should be an important factor in the promotion.

Q. In the event of any important geological question, is it the custom, or do you think it should be the custom, for the Director to summon his assistants to a conference, to hold a Board meeting, as it were?—I think such a step would be advisable.

Q. But that is not done?—For my own part, I have never been consulted in anything by the present Director.

Q. Not in regard to your assistants?—We are generally allowed the final decision. Sometimes I have taken men when urged to do so, and in all cases they have turned out very well, but Sir William Logan allowed us to choose our own assistants, as he held us responsible for the work done.

Q. You stated just now that an impression prevailed among the powers that be that the juniors had no more right to approach the Director directly than privates to approach a general in the army. Do you think it would be advisable, for instance, for the junior of your staff to make a complaint without sending it through you?—I think he should let me know what the complaint was, and then request me to forward it to the Director. I would not, however, be a stickler for rules; he might go directly to the Director, if he chose.

Q. Do you unhesitatingly assert that you have never aided, abetted, assisted or concocted any of those articles which have been published in the papers?—I wish to state emphatically that I have never had anything to do with them.

Q. There has been a good deal of talk about your map of 1877. I suppose those letters which you read are all of recent date?—Yes; the question never came up before. I believe the whole thing is a plot to injure me; I was not aware of it until I returned, and then I obtained the letters which I have read to the Committee. They are not eulogistic, but simply assertions that my map was correct.

Q. Do you claim that that map is a complete survey, or is it simply a running survey, or whatever you choose to term it, and do you hold that, in proportion to the time you devoted to it, it is as accurate as anybody, under similar circumstances, could make it?—It may not be absolutely correct, but many particulars might be added. It is as good a map as could be made by anyone in the same time, but it was merely an incidental piece of work, to utilize the spare time, and has no geological significance whatever. It never would have been missed if it had not been published. I requested that it should not be published, not that I had any doubt of its accuracy, but because it had no connection with the subject of the report, and was not a geological map, in any sense. It is merely published, I believe, as a target to be fired at, not in the public interest, but to do me injury.

Q. Is it geographically correct?—As far as it was possible to make it so, in the time devoted to it.

Q. Then it appears to me that an excessive amount of zeal on your part has dropped you into a hornet's nest?—I do not call it excessive zeal. It costs a good

deal to go to these distant parts of the country, and I think it my duty to devote every hour to the work of the Survey, in some shape or another. It is a small side issue, of no importance, and of the most insignificant, paltry, trifling, minute and microscopic character. I may mention that Dr. Selwyn was aware that I had averaged about 2,000 miles of surveying each year during the twenty-five years I had been on the Survey, or about 40,000 or 50,000 miles altogether, and I challenged him to put his finger on one single error.

Q. Is it part of the work of your profession to do the work of nautical surveying? This appears to be such a trigonometrical survey as I would send into the Admiralty?—It is a survey of the shores. Dr. Selwyn asked me to put the soundings on it also, but there are no two years in which the channel is in the same place, and I said that it would not be advisable to do that.

Q. I see here Bushy Island, Sawpit Island and Moose Island. Are the indentations in the trend of coast-line geographically correct?—Yes; on the whole, I think they could scarcely be improved.

Q. Have the terminal points in these sandbanks been determined by parallel lines of soundings, and by means of forward and back angles, taken to verify the possible extremitie of the sandbanks?—In two or three days it would have been impossible to do so much work, in a distance of 15 miles.

Q. Then this was simply an incidental piece of work, and no part of your profession, really?—A very insignificant part of my work.

Q. If you were called upon, by the Dirictor, to make a nautical survey of that particular locality, is it part of your profession to do so?—No; but I could use the never necessary instruments. I have been familiar with them all these years, but I have attempted to make such a survey. It is no part of my duty to make a nautical survey; a chart is one thing, and a geological survey another. This survey was only a slight addition to our knowledge of geography, and was better than any map which had preceded it.

Q. How many maps have preceedd it?—Only one; that of Samuel Hearne, published in 1795. Dr. Selwyn triumphantly spread out the tracing of this map before me, supposing I had never seen it before, and said: "It is remarkable that this agrees with what Dr. Rae says." I replied, "It is not remarkable at all, but somewhat interesting, that it should do so. Dr. Rae has evidently forgotten all about the geography of this region, and has refreshed his memory by means of Hearne's map." This map shows the breadth of Moose River, at 12 miles above the Factory, to be 16 miles, while everybody knows that it is less than 1 mile. The course of the river above is also shown to be at right to that below, whereas it is all in the same general bearing.

Q. What is the rise and fall to the tide there?—About 10 feet. at spring tides.

Q. How many days did you say you were making the survey?—I suppose two or three days doing the whole thing.

By the Chairman:

Q. Is the time of the chemist entirely occupied?—Yes; very fully occupied; he is a very industrious man, and works, generally, from early in the morning until late at night.

Q. Would it be possible, in your opinion, to utilize the time and skill of the chemist, for the analysis of the different soils of the country, to ascertain their value, for agricultural purposes?—We would require more than one chemist, but we might send the soils to specialists, say in England. A complete analysis of the soils is not made now-a-days, it not being found necessary in order to determine their fertility, but only an approximate analysis, showing the proportion of organic matter, etc.

Q. You hardly think, then, that it would be in the public interest for the Geological Survey to superintend that?—It would be in the public interest.

By Mr. Baker:

Q. Do you not think that, putting the comparison between Canadians, and Englishmen, Irishmen, Scotchmen or Americans out of the question, there is a tendency in the rising generation to kick over the traces and not be subject to discipline

and not to recognize the difference between seniors and juniors?—As education increases, and people come to be governed more by reason than brute force, less of the so-called discipline is necessary.

Q. But deference to seniors is a different thing from what it used to be?—Now-a-days we respect a man for his education and good character more than on account of his position in society. I think there is also a certain amount of respect due from superiors to inferiors, and when a man is nagged at, tyrannized over, and called a liar continually, it is hard for him to be amenable to that kind of discipline.

Q. For instance, suppose a young man in your party were to slap you on the shoulder and say, "Bell, old fellow?"—Such a thing would not be possible. I am not in the habit of allowing my assistants to suppose that they might take such liberties, and none of them would dream of doing so. My experience in the matter of discipline, both as to white men and Indians, has been easy. I have had no difficulty, whatever, with assistants, either white men or Indians.

Q. With proper tact and study of human nature, in keeping with times, a good deal of trouble might be avoided?—Yes; there need be no trouble at all.

By Mr. Wood:

Q. I think I understood you to say that you had been allowed to appoint your own subordinates?—Yes.

Q. And you had a better result than if they had been selected for you for field work?—Yes.

Q. With regard to the Director, you think the same rule should not apply?—I think if he were considered a fair man, and competent to make a good selection, that although it should not be abosolute, he should have the authority to recommend, almost to the power of appointing, but the Government should have the power of vetoing any proposed action, if not in the public interest.

Q. If you had the right man, you think he should have this power?—Yes, of nominating his assistants.

By Mr. Baker:

Q. Is it not a fact that, politically many young fellows are placed on the staff irrespective of the Director, or assistant directors?—I think not; during Sir William Logan's time the worse recommendation a man could bring was that of a member of the Government or Parliament; it would destroy his chances, if anything would.

Q. But have not appointments been made irrespective of the Director?—I think not; perhaps a little political pressure has been used in one or two cases, but not generally.

Q. Has it increased, or is it tending in that direction?—Perhaps it is, but still it has not reached alarming proportions. I, myself have been obliged to refuse one request by a Minister of the Interior.

HOUSE OF COMMONS, OTTAWA, 19th March, 1884.

The Select Committee on Geological Surveys met this afternoon, Mr. HALL in the Chair.

Dr. T. STERRY HUNT, of Montreal, was called and examined.

By the Chairman:

Q. You were formerly connected with the Geological Survey of Canada?—I was, from 1847 to 1872.

Q. What were your previous studies and qualifications for geological work?—I had, from my boyhood, almost, been trained up for chemical and mineralogical work, and had been for two or three years a special student at New Haven under the late Prof. Silliman, and Prof. Dana.

Q. Your first connection with the Geological Survey was, of course, under Sir William Logan?—Yes.

Q. And continued under him until his resignation?—It was continuous from February, 1847, to June, 1872, when my resignation took effect. I resigned my position after the appointment of the present Director.

Q. You have since continued your devotions to chemical science, and to the study of geology and mineralogy?—I was for six years a Professor of Geology in the Institute of Technology at Boston, Mass., from 1872 to 1878, and I might say during this time and since I have been constantly employed in a private capacity in geological studies over most of the United States, east to west, and from north to south, and more or less in Great Britain and on the continent.

Q. What titles do you hold as a recognition of your devotion to science and your experience in them?—Perhaps the title I should first mention is that I am Fellow of the Royal Society of London, a rank which I have held for twenty-five years, and a Fellow of the Geological Societies in France, in Belgium, in Austria and in Ireland. I might say that I have also been President of the Institute of Mining Engineers of the United States, and also President of the Chemical Society of the United States. In 1881, avowedly in recognition of eminent services in geology, the University of Cambridge, in England, conferred on me the honorary degree of Doctor of Laws. I have received special recognition from the French Government, having been made an officer of the Legion of Honor, and last year I also received special recognition from the King of Italy, being made an officer of St. Mauritius and St. Lazarus, that was avowedly in recognition of my geological services. I am also a member of the National Academy of Science of the United States.

Q. Will you explain to the Committee what was your position in connection with the Geological Survey of Canada?—I was appointed chemist and mineralogist to the Geological Survey. It was considered that, as we had especially to deal with the mineral wealth of the country, a chemist and mineralogist was very necessary, and I was appointed to that position on the Survey. I might say that I had previously been appointed to that position in the State of Vermont, where a survey was then going on, but which I resigned to accept the position here.

Q. That was your position when you first connected yourself with the service. Did your position change relatively to the Survey or to the Director of it in time?—No, not nominally; I still retained the name of chemist and mineralogist, but with the growth of the Survey my salary was increased, and I had an assistant, and I occupied myself with a great many cognate questions, applying chemistry and mineralogy to the geological questions raised, and also doing a great deal of field work. I may say that during the last two or three years of Sir William Logan's administration, he was absent from the country a great deal, and practically the whole duty of directing the Survey devolved upon me. I had power of attorney to receive and pay all moneys for two years, and also organized all the parties and employed the assissants.

Q. What was your relative position, in so far as Sir William Logan himself was concerned? You might be considered as his chief assistant?—Yes; I may mention, as an index of it, that in 1867, on the organization of the Dominion, Sir William stated to me that the salary which I had been receiving for my services was too small, and that I must get an increase. "I would make your salary the same as my own," he said, "but there must be a distinction, and I will make it $200 less than my own." I was really his assistant, and did a great part of the work.

Q. What were your salaries then?—$2,800 and $3,000. Sir William's was £750 sterling, and my own was £700 currency. It was not until I was leaving the Survey that I told the Minister that, as I was no longer interested in the matter, I would say to him that all the salaries were too small, and that I would recommend him to raise the salary of the Director to $4,000 and the others in proportion. I have reason to believe that it was mainly on my recommendation that it was raised.

Q. In what year did Sir William Logan resign?—Sir William resigned, so far as I can remember, some time in 1869.

Q. Had the present Director any previous connection with the Survey, previous to Sir William's resignation?—None. He was brought out from England to take a position on the Survey, by Sir William himself.

Q. What had been his previous position?—He had been an assistant for several years on the Geological Survey in England, and was then sent out to Australia, where he had charge of a Survey in the Province of Victoria. That Survey was abolished in 1867 or 1868, as I am informed.

Q. Was he a man with a University education, and holding a University degree?—Not that I am aware of; I think I may safely say that he was not. He did not use an Academic degree, at any rate, and I think he is not a University man.

Q. When he was brought out here, at the time of Sir William Logan's resignation, did he hold any titles from the societies in Great Britain, in recognition of his services?—Not that I am aware of. I know he sought after the title of F.R.S., after coming here, and obtained it.

Q. Would you please state to the Committee, as fully as you choose, what were the functions of the Geological Survey, as you understood them, at that time?—When I came on the Survey, they were two-fold; in the first place, there was the exploration of new regions; more or less of topographical work had to be done for foundations for geological delineations. The whole western country was new at that time; we knew nothing of the relations of the great groups of rocks to one another. One of the first things we had to find out was the relations of the coal formations to Upper and Lower Canada; great outlines had to be sketched and a great deal of topographical work had to be done, and the question of the economic minerals of the country next claimed attention. The copper of Lake Superior was just coming into note, the iron deposits were just being found in various parts of the country, and also the copper of Lake Huron and of the Eastern Townships. Of course, with all that had to be done, work of general geology, in order to determine the relations of the ore deposit of certain rocks, so that in future we might, from the rocks of the country, be able to say where the ores were to be found. This was indispensable. It was a new country, and the whole relation of the ore deposits had to be made out; nothing in that way had been done even on the other side of the line. We were the pioneers in the work of defining the geological relations of our mineral wealth for North America. Sir William Logan, I should say, was first and foremost a practical miner and mining engineer, and it was as such that he was selected for his position. He had acquired his reputation as a careful explorer and mapper of the Welsh coal fields, and had also a practical experience in smelting, copper mining and the buying of copper ores. It was for these reasons that he was selected, and that is the basis of his usefulness, from a practical point of view. Thus, you will see, that the early work of the Survey was, in the first place, to determine the geological relations of coal, iron and copper deposits, and around them the stratigraphical geology of the country grew up. A careful chemical analysis of all materials were made, and also a preliminary study of the soils of the country and their relations to agriculture, and of the mineral waters of the country and their economical and medicinal values. There were special memoirs prepared on the questions relating to the metallurgy of iron and steel, and these were published in the reports of the Survey; these were of value to Canada in utilizing the iron of the country.

Q. Was there any attention paid to building material?—Yes; the whole question of our granites, marbles, roofing, slates, bricks, clays, cements, sandstones, &c.; from every available quarry we procured marbles, which were cut and polished, and considerable sums of money were spent in order to display these materials. We are just beginning to reap the advantage of it. Careful explorations were made upon the porosity of building stones, and the method which I adopted of determining the absorptive character of these building stones has since been adopted in the United States and Great Britain. Then the question of fertilizers was taken up, as well as the question of manures for the soil. I first called attention to the mineral phosphates of the country, and the mode of utilizing them; there was also the question of fish manure and the wastes of the fisheries of the Gulf. I considered these questions as important, bearing as they did upon the agriculture of the country, and were just such methods as we required. I studied, also, in that connection, all the facts with regard to pretoleum—its discovery and its distribution—and from its discovery in 1861, followed

it up for some eight or nine years, furnishing all the information that could be gathered on the subject, and determining essentially the facts with regard to the distribution of oil in the country; in fact, I prepared a special memoir on the subject, at the special request of the Government, as well as the information which was published in the report. The whole question of the gold of the country was early made a subject of investigation; Sir William Logan spent over two years in succession, and devoted a good deal of time on several other occasions, and I have spent as much or more time, in collecting as far as possible, facts with regard to the distribution of gold in the Eastern Townships. In that connection I have studied the question of the hydraulic washing of gold as first practiced in California, more than twenty years ago, and which is now adopted in the Chaudière district. Later, the whole question of the gold of Nova Scotia and also of the Madoc region, engaged the attention of the Survey, and a fresh examination of the gold of the Chaudière District and the Eastern Townships, was undertaken in 1868. I engaged for making the surveys, a Mr. Michel, an able French engineer of great experience, and prepared, with him, a report on the gold of Nova Scotia, and also in parts of Ontario and Quebec. That is the kind of work we were doing, and all these things were left by Sir William Logan to me. Then the question of salt demanded our attention; when salt was first discovered by accident in a boring at Goderich, I commenced a careful examination of the brines at repeated intervals, and went to the United States and studied the question of making salt by solar evaporation, as well as by boiling, and published an extended paper, with tables on the strength of brines, and all the economic information that I could collect with regard to it. All this information was embodied in the report of the Geological Survey. In the same way the early facts with regard to the discovery of the mineral phosphate of lime, apatite, which I first made known, were represented in special discussions of the matter in 1863, and again as late as 1869. Questions with regard to the distillation of shales and the extraction of mineral oils were also investigated in the laboratory of the Survey, the results of these investigations being published. I mention this to show how many of these questions arose, and what I considered were the duties of the chemist of the Geological Survey.

Q. Will you also mention if, during Sir William Logan's administration and your own, there were not important geological discoveries made which attracted the attention of the whole world?—Most undoubtedly. As for the Laurentide hills, we first recognized the fact that they constituted a great group of vast antiquity, to which Sir William Logan and myself first gave the name of the Laurentian Series, and then identified them with similar rocks in England, and in Norway, and in Sweden. This name of "Laurentian Series" is now written all over the geological map of Europe.

Q. The correctness of your discoveries in reference to these rocks has been recognized by other scientists and geologists throughout the world?—Most certainly. There have been some geologists in England who have doubted them, but the great teachers of geology in England and elsewhere admit of the correctness of our discoveries with regard to the Laurentian Series. Afterwards, the name of Huronian was given by me, in 1855, to the rocks of the district of Lake Huron. The Director of the Geological Survey of Austria assures me that he recognized them in the Alps, and that our three great groups—the Laurentian, Huronian and Mont Alban—are the key to the rocks of the eastern Alps, and these discoveries, first made known by the Geological Survey of Canada, are recognized by Italians, by Germans, by Frenchmen, and by Austrians. In the last volume of the Royal Society of Canada, just published, I brought out some of these facts, showing that this, especially the great groups of pre Cambrian rocks, was a question of great importance. These are great facts which have been acquired to science by the work of the Geological Survey of Canada, and their value has been recognized by the first geologists of Europe.

Q. Sir William was very much devoted, personally, to science, was he not?—Yes; he was a very single-hearted, simple-minded, and industrious man in his study: his practical work as a mining engineer and mapper, and a worker of coal; and also his practical work in connection with copper, was of great service to the country. He turned his attention to these studies and pursued them with a great deal of zeal and

practical earnestness. He was a man who had not previously had a scientific education, but he availed himself of every opportunity to learn; he was never above learning from any man, and that was why he tried to get around him men who could aid him in every department.

Q. Of whom did the staff consist at the time you joined the Survey?—Of Sir William Logan, Mr. Alexander Murray (subsequently Director of the Geological Survey of Newfoundland), and myself. Then Mr. Richardson was employed as a field hand and explorer, and was not an officer of the Survey, except in later years. Later, more explorers were attached, Mr. Bell, who was then quite a young man, being taken on. Mr. Murray resigned, to accept the position of Director of the Geological Survey of Newfoundland. Mr. Billings was appointed palæontologist about 1855 or 1856. At the time of Sir William's resignation, there were on the staff Mr. Billings, Dr. Bell and myself, and Mr. Barlow was attached as mapper. Mr. Thomas Macfarlane was on the staff for about two years; he may have been a member at the time of Sir William's resignation, but my impression is that he had already resigned. In fact, in 1869, Sir William, anticipating his own resignation, said he wanted to find somebody as a colleague for me, and Dr. Selwyn was proposed; I wished to have Mr. Murray brought back, but he declined to come, as he had the Directorship of the Survey in Newfoundland. Well, Mr. Selwyn was brought out, as I supposed, to be a colleague for me, but he was afterwards placed over me as my superior. At that time the means of the Survey were not nearly so large as now.

Q. What was the appropriation during those years?—My impression is that for many years it was only $20,000 per annum, which included everything. Sir William Logan's salary was $2,000, Mr. Murray's $1,600 and my own $1,200; subsequently, my salary was raised to $1,600, and in 1867 it was further raised to $2,800, so that all this work was done with very small salary. There might have been high thinking in those days, but very plain living, and very hard work.

Q. What had the cost increased to at the time of Sir William Logan's resignation?—My impression is that it went up to $40,000, or perhaps $50,000. There were also, in addition to those I have mentioned, one or two young men employed in subordinate positions; I am inclined to think that Mr. Webster was connected with the Survey, but he held a subordinate position. I believe Mr. Webster was born in Canada, and received his education here. Mr. D'Urban, who was also on the Survey at that time, as well as being nominally librarian, did a great deal of work in the field; he was afterwards a successful teacher of science in England, and is now in charge of the Science Museum at Exeter, England, and occupies a high social position there; he has done some good work in botany.

Q. Was Sir William Logan's attention devoted to the interests of the Survey indirectly, even after he severed his connection with it?—Yes; he worked for a long time, even while his health was failing, and when he has told me that he had never passed a night without severe pain and sleeplessness, but still he carried on his work, principally in the Eastern Townships.

Q. Are you aware that he was studying some geological questions of importance and interest, and that he had some assistance from the Geological Survey in conducting those?—I would not say much about that, because he was endeavouring to establish a theory in which he was undoubtedly in error. There was no reason, however, that I know of, why his honest work should not have been published, unless he wished the contrary.

HOUSE OF COMMONS, OTTAWA, 20th March, 1884.

The Select Committee on Geological Surveys met this morning, Mr. HALL in the Chair.

Dr. T. STERRY HUNT, of Montreal, was again called and examined.

By the Chairman:

Q. You mentioned the name of Mr. Thos. Macfarlane among those formely connected with the Survey. Mr. Macfarlane is temporarily absent in Europe, but his

views have been obtained in writing and submitted to the Committee, and I would like you to give us your opinion as to his experience and qualifications for giving such evidence, so that it may be properly appreciated by the Committee?—He is a graduate of the School of Mines, at Freiberg, the oldest and most important School of Mines probably in the world, and whose pupils take the highest rank everywhere. While pursuing his studies there he was sent, on the recommendation of his Professors, to conduct metallurgical operations in Norway, where he made some very important and elaborate studies on the older rocks of Norway, which he has publiseed, and which are highly appreciated by scientists both in the old and new world. He then came out to Canada to take charge of copper smelting works and continued operations of that kind in the Eastern Townships, becoming afterwards attached to the Geological Survey of Canada. It was through my own recommendation, seeing his high qualifications, that he was employed. He remained for some two or three years, and his reports are of the greatest value; in fact, they are models of what reports should be. He reported upon mining deposits in various parts of Hastings County and around Lake Superior. I might also say that he made comparative studies of the north and south shores of the Lake in order to establish the similarity between the two, and subsequent writers quote his work extensively; in fact, Mr. Macfarlane's work is a standard authority. He resigned his position on the Survey, and then went up, in the employ of the Montreal Mining Company, to explore their mineral lands on the shore of Lake Superior, and was the discoverer of the famous Silver Islet Mine. Afterwards, on behalf of the American Company, who purchased it, he built smelting works in Detroit.

By Mr. Dawson:

Q. The only disagreement, I believe, between Mr. Macfarlane, and Sir William Logan was with relation to the age of some rocks?—Yes; and I may say that the late results have justified Mr. Macfarlane's view, and have also shown how Sir William's view might also be reconciled with it. Mr. Macfarlane then made explorations of the Rocky Mountains and visited South America also for metallurgical researches for American capitalists. I know his status, not only from his publications but from the fact of his being a student at Freiberg under such eminent scientists as Messrs. Hague and Pumpelly. He has published papers not only upon questions of geology, but on questions of lithology, of iron smelting, and of the treatment of copper ores, and many others which are extremely valuable to science.

By the Chairman:

Q. How long did you retain your connection with the Survey after the appointment of the present Director?—About two and a-half years. I tried to find some way of getting along, as I was unwilling to leave and I remained the second year, but the petty annoyances which I had to put up with increased and I sent in my resignation about the end of 1871 or the beginning of 1872. Dr. Selwyn was sworn in, I think, at the close of 1869. It was a determined attempt on his part, as he found that I had a status in the country and that I was looked upon as an authority, which he was not; he was very unwilling that any one should appeal to me and wanted to cut off my power by curtailing certain work; I had been in the habit of being alternately in the field and laboratory but I was now kept more in the laboratory.

Q. I suppose since you severed your connection with the Survey you have kept yourself informed as to its progress and management, and the system under which it has been conducted, to a certain extent?—Yes; of course I have always received the reports and read them over more or less, and have been in the habit of seeing the Museum once or twice a year, and have always kept up friendly relations with Dr. Selwyn.

Q. Do you see any indications of any change in the system under which it was managed in Sir William Logan's time, and in what direction do those changes tend?—They tend, in the first place, to diminish the usefulness of the Survey, by taking its attention from practical work in economic geology and mining. It was a constant object with myself and Sir William Logan, who understood and appreciated perfectly my motives, and also assisted me by every means in his power, that the great

work of the Survey was to look into every chemical, mineralogical or metallurgical question, that could apply to the mineral resources of the country as, I have already explained. Then there was the question of fish manure and soils; all these subjects engaged my time and attention, and the investigation of them attracted the attention of the public generally.

Q. Why are these subjects now neglected?—Because the Director is not practically familiar with these subjects, and does not know their importance. He was not very long on the Survey before I discovered that he knew less of the importance of these subjects than an intelligent University student might be expected to know. This is one of the directions in which the work of the Survey has been changed, and in the second place, much attention has been paid to explorations and to field work, to mapping and topography, and also to general natural history. The study of the plants, the cataloguing and distribution of them, and of insects and birds, &c., all have a considerable value; and if we had sufficient means we might do these things, but should not leave others undone. The great thing which the country requires is a knowledge of the natural history, that will have its immediate practical application; for instance, so far as the insects are injurious or beneficial to the agriculture, and the United States have an entomoligist for that purpose. So far as botany is concerned, the distribution of our forests, the capabilities of acclimatization of useful plants and their adaptability to different soils, may all be valuable, and a mere dry catalogue of these things is of no immediate or practical interest. If I had a quarter of a million of dollars to spend on a Survey of this kind, I might have some attention paid to general botany and general zoology, but I would not have it done if I am obliged to curtail this immediately practical work. These are like the elegancies of science that come after the necessities.

Q. The attention of the Committee has been called to the very numerous changes that have occurred in the *personnel* of the staff since the present Director's connection with it. You are familiar, I suppose, with many of those changes?—Yes, to a certain extent. First, there is my own case, and I cannot say whether Mr. Webster resigned before Dr. Selwyn came or not. Mr. Webster was on the Survey, and a very valuable man he was; he left and went to the North-West. As to the minor changes, I know of them only by hearsay. When I left the Survey I recommended Dr. Harrington as chemist and mineralogist, which position he held for three or four years, and then resigned; he is now a professor in McGill University, and a well educated and trained chemist and mineralogist. As for these later changes, I only know of them by hearsay. Mr. Ford I knew very well, as an excellent paleontologist; he left last year because he was dissatisfied.

Q. How do you think the status and position of the Survey, as at present conducted, compare with its position and reputation under the administration of Sir William Logan? I refer to its estimation by the outside world?—I should say it is falling off very considerably. In Sir William Logan's time the Survey was doing work that was attracting the attention of the outer world, the work of mapping out the old Laurentian and Huronian rocks, the work of Mr. Billings in paleontology and the work I was doing in chemistry and mineralogy. I do not know whether in the last ten or twelve years there has been anything of note done to attract attention; I would be glad to mention it if I could, but on looking back it is a blank as far as my observation goes. I do not mean to say that there have not been valuable observations in the North-West; Dr. Dawson has given us excellent observations of the western coast, and Dr. Bell has given us some useful information with reference to the Hudson Bay, with regard to the rock distribution of this region; the continuation of the rocks south of the boundary line has been traced northward, and while I wish to say that the work which Dr. Dawson and Dr. Bell have been sent to do, they have done well. I will also say that they might have been better employed at more immediately profitable work. In the same way Messrs. Ells, Fletcher and Bailey have done some good work in the Eastern Provinces, and I would also say that much of Mr. Vennor's work in noting the distribution of the rocks between the Ottawa and the St. Lawrence deserves respectful mention. The work of the survey during

the last few years has not had the dignity nor *eclat* which it should have, because the energies of the staff have not been properly directed. I notice that Dr. Selwyn says that it would be impossible to prepare such reports as are published in the United States on the mineral resources, because it would require highly paid mining engineers and metallurgists. Dr. George Dawson was educated in the Royal School of Mines, one of the best mining schools in the world, and when he came out to this country was fully prepared for just such work. Mr. Macfarlane was also just the man for such work, and Mr. Fraser Torrance, who was also educated at the great School of Mines, at Freiberg, and a native Canadian. Then there was Mr. Coste, also a native Canadian, and a distinguished graduate of the School of Mines, at Paris, and Mr. Frank Adams, assistant to Mr. Hoffmann, himself a very good chemist, was educated at McGill University, and afterwards at Yale, and had the advantage of studies in modern chemistry and mineralogy, and in German and other foreign literature of these sciencies. And yet we are told that there are not competent mining engineers and metallurgists to be had. Mr. Coste was discharged, and I believe taken back again and placed in a very inferior position, not at all in the position his talents deserve; Mr. Torrance, Mr. Adams, and Mr. Macfarlane left, and Dr. George Dawson, who might have done this work, has been employed in other directions. I should not know where to look for better men than those who had graduated in these schools.

Q. And do you not think that, other things being equal, young Canadians who are familiar with their country and climate, are better adapted for honest work on the Survey than persons from abroad?—Most decidedly; and besides they have a patriotic interest in their country, and have a right to be employed, rather than strangers.

Q. Comparing the progress of the Geological Survey of Canada with the progress of Geological Surveys in other countries, it becomes necessary to ask you what progress has been made during the last ten or fifteen years in other countries?—The conditions, of course, of the old world are not so well adapted to bear directly on our case as those nearer home. Still, you might like to hear what is being done in England. The question of mining statistics has been brought up. In this connection the Geological Survey of England should not be taken at all as a standard here, because it professes to occupy itself chiefly with topographical and geological work, and questions of mining and metallurgy do not engage its attention; they had a Keeper of Mining Records attached to the Geological Survey, Mr. Hunt, who undertook to get mining statistics as volunteer contributions; he prepared and published these and was in some way attached to the Geological Survey, but a few years ago there was a mining inspection Act passed, primarily for the protection of miners and those employed in the mining industry, which had power to enquire into all the mines in the country and to make reports on the labour employed, and the production and value; but open workings, however, such as alluvial mines, were not included, and in 1881-82, about two years ago, the Treasury Department, seeing that this work was being duplicated in this way, passed a new Act, and the work is directed by mining inspectors, whose business it is to collect all these materials and report to the Home Office. The report of last year is only just out, but I have seen an abstract of it; it publishes simply statistics which are of value only to the financier and economist.

Q. When you state that the Geological Survey of Great Britain has paid no attention to mineral statistics, I take it that it was not because they had no value, but because they assumed their collection belonged to a subordinate or separate department?—I mean that it paid no attention to mineral resources, and did not investigate the question of metallurgy and the economic use of minerals. In France all these economic questions come in the first rank. France has a regular corps of mining engineers, part of the Civil Service, whose primary work is to inspect all mining districts and to give information to the public at frequent intervals. An official journal is published regularly. The work of the Geological Survey is detailed to men selected from the corps of mining engineers. These same mining engineers are sent all over

the world to make studies of the mineral resourses of other countries; they have published valuable memoirs on the resources of this country.

Q. Are you aware that the Geological Survey of France has a Department connected with the Government? Is it a subordinate branch of the Department, as it is here, or is it an independent Department, with a Minister at its head?—Not indipendent; I think it is under the Department of the Minister of the Interior; that is, the corps of mining engineers; I cannot say positively under what Department the geological maps are published, but I think it is under the Department of the Interior also. But it is in the United States that we have to look for circumstances more nearly like our own, and there have been many State Surveys which have done admirable work, especially those of Ohio, Alabama, Kentuckey, Pennsylvania and New Jersy. Pennsylvania, in many respects, is a model, and has within the last few years, been expending about $50,000 annually, in a careful survey of all the points relating to the distribution of its rocks, and the geological relation of its iron deposits, of its salt and petroium, and of the bituminous and anthracite coal, the results of which have been published in small volumes, at the cost of paper and printing. Each mineral is dealt with in a separate volume, so that anyone wishing the information on any particular subject, has only to get that particular volume, and does not have to buy a volume containing information on all the questions. The great work of the mining industries of the Territories, the regions west of the Mississippi, were formerly, during many years, in charge of the Commissioner of Mines, who, himself, and through his subordinates, carefully collected all the facts, from each mining district, and published it in a volume.

Q. That was under the charge of the Federal Government, I suppose?—Yes; and at the same time, important work in these regions, was also being done by the surveys of Hayden, of Wheeler, and of Clarence King; it was called the s urvey of the 40th parallel. Impressed with the importance of consolidating this work, and also of extending the Geological Survey to the older States, where the work had been partially done years ago, they have, within the last few years, organized a General Geological Survey, under the direction of the Federal Government, a survey which covers the whole field, from ocean to ocean, and is employing specialists to take charge of the different regions, and also, to a certain extent, the different subjects within these regions. They have published special monographs of the great mining regions of the West; for instance, the great Comstock load, which has yielded 350 millions of bullion, and which is the second memoir the United States Government have published on that region. In the survey of the 40th parallel is given a complete description of the mining, as it was ten or twelve years ago, and the machinery and the best matallurgical methods used. The same thing has been done with the Eureka District, in Southern Nevada. The United States Geological Survey has also published, as a general guide and handbook, within the last year, a little volume on the mineral resources of the United States, covering 800 pages; the price of it being fifty cents. Any person who will take the trouble to look over it will find that it embraces a discussion of all the economic minerals, coal, iron, petroleum, structural material, building stones, bricks, tiles, cements, abrasive materials, precious stones, salt, borax, sulphur, &c., &c. Besides these, it gives an excellent description of metallurgical methods. There is also a complete review of the minerals of the United States, arranged by States, and the materials classified; a little over one hundred pages are devoted to this catalogue. Besides this compendium, there are special monographs published on a great many geological, mineralogical and paleontogical questions, both practical and theoretical, with valuable maps and illustrations, all published for the cost of publication. Then there is the question of mining statistics, giving particulars, not only of the statistics, but the history and growth of every mining industry, and the cost of material in every place. This is the way in which the work is being conducted in the United States; while considerable attention is being devoted to purely theoretical geology, they are putting in the formost branch all the questions with regard to coal, and the possible uses of the mineral wealth of the country. Any one interested in the question of phosphates as fertilizers will find here a

memoir of about twenty pages, written by specialists on the ground, and giving a history of the mine and the industry connected with the phosphates, and the whole of the statistics relating thereto. They are not purely statistics, but are combined with mineralogical and geological information. I have just received a volume from the State of Alabama, containing a report of the work of the Geological Survey in connection with the Census Commission of 1880, which includes a most valuable report on the relations of geology to that region. This report is published as the work of the State Geological Survey, and contains the complete exposition of the relations between the rocks and the soil drainage, and adaptibility to various crops, as well as accounts of the rainfall in summer and winter, the temperatures and forest distribution, all of which are considered with reference to the physical geography and geology. I will read you a paragraph from a report written by Prof. Eugene Shith, which is as follows: "Whence have the material of these soils come; by what agencies have they been prepared and distributed; how have the products of rock disintegration come to assume the peculiar mechanical condition which characterizes soils; how have soils acquired these chemical qualities which distinguish them from the solid parts of the earth's crust; upon what constituents do their remarkable property of absorption depend; and by what means are they affected? These are questions which must interest every one who cares to look beyond the mere surface of things, and to answer them in some measure has been my aim in the first part of the report." The basis of intelligent and scientific agriculture has been prominently placed in his report.

Q. Do you know the appropriation for the State of Alabama?—I do not think it is more than $5,000 or $6,000 a year; I know it is very small, for he gives, as one of the reasons why he was not able to report fuller, and with more maps and illustrations, is that it would have required the whole appropriation allowed by the State for many years. The report discusses the variety of soils in the State, their composition, and their origin and fertility, and then takes up the question of the different crops, and shows the temperature, the rainfall and the distribution of the forests, and their relations to the cotton culture. In fact, I do not hesitate to say that the facts published in such a volume would be of more immediate practical value to Canada than the volumes of the Geological Survey for the last ten years, which have cost so much money. I might also call your attention briefly to the work that has been done lately in California; they had a Geological Survey in California, and to tell the history of it would be almost to repeat the history of the Geological Survey of Canada, except that it was put an end to by the Legislature three years ago, and since then, in a humble way, a State Mining Bureau has been established. The Bill appointing it was passed in 1880, and the State Mineralogist, in a short report, presented on the 30th of June, says: "The California State Mining Bureau was created by an Act of the twenty-third Legislature, approved April 16th, 1880. The first section of the Act provides for a principal office in the City of San Francisco, 'in which there shall be collected and preserved for study and reference, all the geological and mineralogical substances—including mineral waters found in the State.' The same section further provides for a collection of mineral rocks and fossils of other States, Territories and countries, to be at all reasonable hours open for inspection and examination and study. A Section provides for a library of works on mineralogy, geology, and mining, and a collection of models and drawings, of mining and modelling machinery used in the reduction of ores, and directs the opening of correspondence to obtain information respecting improvements in mining machinery of practical value to the people in the State. The State mineralogist is instructed to visit the several mining districts to ascertain and record their history, and to describe their geology and the ores they produce. At the close of the year he is directed to report in detail to the Governor. By section four, the State mineralogist is allowed to appoint assistants when the condition of the funds will permit. All other provisions are secondary and subservient to the Museum, which is made the principal feature of the institution." When speak- of the importance of Museums, he says: "What applies to other countries applies equally to California, for if there is any State that needs to show her natural re-

sources, it is California, which has so long invited capital from abroad, and begins to wonder why the population is so small when her natural resources are so great." And then he goes on to say: "There have been so many mistakes regarding the character of our mining districts, and so many misstatements to those who have been asked to invest their capital in California, that there is need of an official source of information relating to the varied resources of the State. This can be best accomplished by granting to the institution a liberal support. While this institution is called a Mining Bureau, its usefulness has been general, and the merchant, manufacturer and agriculturist are, and should be, deeply interested in its success." It is unnecessary to say that these remarks are quite applicable to Canada. This report contains a special memoir on the borax deposits of California, the greatest producing borax region in the world. Other memoirs and papers have already been published by this Bureau, on hydraulic mining of salt, diamonds, &c., since the establishment of the Bureau. Take the example, again, of the Geological Survey of the State of New Jersey, which has not only lately published special memoirs on its iron ores, but a volume upon its clays used for pottery and other purposes, the mining of which is a great source of wealth to the State.

Q. Can you suggest any changes in our present system which would, in your opinion, improve its efficiency? If so, what changes would you recommend, and how much increased expense, if any, would such changes entail?—That is a very large question, and one would have to weigh many considerations before coming to a conclusion. My great point would be, as I said, to imitate in some respects the Mining Bureau just described, and to have men charged with the business of looking after the mining regions, either taking it up in regions, or in special subjects; for instance, one might take up the mining industries, a second the salt, and a third the copper, the report showing the exact state of these industries at the present time, their past history so far as we know, and suggestions for their future development which may be considered necessary. Great ignorance exists among the people as to what constitutes a mine, and what are the conditions that warrant the expenditure of money in opening them. Many a time money has been spent in the following up of little leads, which are of no economic value at all, and at other times valuable deposits are passed by because the persons having them are really ignorant of the true way to work them. There should be a Bureau in which instructions might be given with regard to the best modes of opening mines and utilizing their material, whether smelting should be undertaken, and whether iron manufacture should be undertaken, and what methods are best adapted for the region, and for the ore. Large sums of money have been spent uselessly in this direction, in the last few years, and it is not only the waste of capital which should be considered, but it also produced discouragement and want of confidence in the metallurgical industries throughout the country. Therefore, I think we want skilled and trained mining engineers and metallurgists to give information upon almost every point throughout the country. There should also be a library, not merely of scientific and theoretical books, but a library where any person could go and consult the works which would give them the information which they required, and where they might see models of mines, machinery, furnaces, &c., which would give them an idea of how underground work is done. The history of the apatite mining in Canada shows what mischief is done when such mines are left in the hands of persons ignorant of mining. Therefore we want practical instruction available to every one in the best methods of mining and of abstracting the materials. Then I think the subjects of the soil and their relation to agriculture ought to be put in the hands of persons specially competent to deal with it. I am not prepared to say, as I know so little of the work that has been done in the great North-West in the past few years, how far the Geological Survey has undertaken work which might be left to another department, because I am not aware of the amount of work of that kind which has been done, though I have reason to believe that large sums of money have been expended in that direction. I think the construction of the detailed geological maps of these regions is subordinate to the great economic question, and should grow up slowly with the

advancement of economics. I should want to look more carefully into the whole question of the administration of late years, and of the extent of the topographical work done, before I would say that too much of the energies of the staff had been devoted to it, but I am inclined to think that the attention paid to topographical and general geographical exploration might be expended to greater advantage on this mining question. We want thorough information on the great coal question of the North-West, and we do not know where to find it. I think the Survey might be made very much more efficient than it is now with the present expenditure of money; I also think that the members of the staff might be employed in better work, or in other words, with the same expenditure of labor and money, under the judicious direction of somebody who knew what was wanted, the Survey might be made of vastly more service to the country. I make no charges against the men of the staff, but I do not think the head of the staff is either competent or efficient. He has no method of working, and changes his moods from one day to another, as I have occasion to know.

By Mr. Dawson:

Q. Of course the Geological Survey had attained a very high position under the direction of Sir William Logan and Dr. Hunt and Mr. Billings, whose names are known all over the civilized world, and I believe they will be historical, and that it would be difficult to find such a staff now. The Survey was very popular then, but it is very unpopular now?—I would say one reason why the Survey was popular then, was that Sir William Logan and myself were always ready to give our time and our knowledge to all those who came to seek for information three and four hours being frequently spent in explaining elementary facts to them.

Q. Do you not think that there is the material in this country for the formation of a very efficient staff without sending to England or to foreign countries?—Most undoubtedly, and if I were charged with a work of this kind, even with twice the money now expended, I think I should be able to find in the country all the material I should want. I would not ask for better men than Mr. Macfarlane, Mr. Coste, Dr. Harrington, Dr. George Dawson, Dr Bell, Mr. Hoffman, Mr. Torrance, Mr. Adams, to say nothing of the other gentlemen I have mentioned, some of whom, such as Mr. Torrance and Mr. Coste, have returned to Canada with advantages of education in the European Schools of Mines. I might also mention Abbé Laflamme, of the University of Laval, who has rendered much valuable service. I think we have all the material in the country for an efficient staff.

Q. It has been given in evidence before the Committee that the work of Sir William Logan's later years, which might possible be of very great value, has been suppressed, and not only that, but that some notes of his had been taken credit for by the present Director of the Survey?—As regards the latter charge, with reference to the publication of the map of part of south-eastern Quebec, by Mr. Selwyn, it is certainly a very remarkable thing. I see it is stated that the map was prepared by the "Geological corps, Alfred R. C. Selwyn, Director." The work was almost entirely done under the direction of Sir William, and was engraved in 1868 with Sir William Logan's name. Subsequently Dr. Selwyn allowed this to be printed as a topographical map and omitting Sir William Logan's name and substituting his own. This work was compiled under Sir William Logan's direction by the late Mr. Barlow, cartographer to the Geological Survey, and could not be called the work of the geological corps. It should have been stated that it was done under the direction of Sir William Logan, and then Mr. Selwyn might modestly have put his name below as the present Director, if he chose to do so. As to the geological coloring adopted by Sir William Logan for his map of that region, it involved certain serious errors, which I was the first to point out, in 1870—errors in the interpretation of the rocks and with regard to their distribution. Sir William Logan, who was also assisted by Dr. Bell, Mr. Murray, Mr. Webster, and myself, worked a great many years in collecting the geological material for this map. Sir William's interpretation of these results was vitiated by his theory, and Dr. Selwyn subsequently adopted my interpretation of this distribution, and colored the map in accordance therewith. I think it might be pub-

lished as a map prepared under the direction of Sir William Logan, with subsequent corrections, and giving Sir William and his staff credit for the twenty years' work which they had done.

Q. It was a great wrong to Sir William Logan?—Yes. I understand that Dr. Selwyn says that Sir William Logan wished the map suppressed. Of course I can not tell as to that. I say it with all respect, that Sir William was wrong in the position which he took in regard to these rocks, and that I was right, and subsequent investigations, not only in North America, but in the Alps and other parts of the world, have shown that Sir William was wrong in his views; but Sir William had a right to have the map published if he chose.

Q. Do you not consider that this volume, representing the work of 1880-81-82, is rather meagre, for the immense amount which the Survey has cost, and supposing that it were valuable as a report itself, should it not be more widely distributed? We are told that 4,000 copies of it have been printed, 2,000 of which are put in a book store at Montreal, and also at another book store in Ottawa, for sale. Should not the public have the benefit of this report?—Yes, provided it is worth distributing. I cannot suggest any better mode than that prevailing in Pennsylvania; they sterotype the forms so that an additional edition can be struck off without much trouble. They also publish forty or fifty of these volumes, one on each different subject, and they are bound together in cloth, and sold from 30 to 50 cents each. A limited number are sent to libraries and public institutions free, and also distributed by way of exchange. These separate reports on the different subjects, sometimes embrace only one county, and sometimes several counties, or in other words, small mining and geological districts, extending over one or more counties.

Q. Speaking generally, I should infer from what you have said, that what is most needed at present, is a good head to the Survey?—Yes; the Director, I think, should have some clear and well-defined notions upon the great leading questions of geology, mineralogy, natural history, lithology, stratagraphy and palæontology, which must form the basis of all intelligent work.

By Mr. Wood:

Q. I think I understood you to say, that the United States Survey dealt largely with the character of the soils, and the extent of the cultivation of corn and cotton? I think they have a Bureau of Agriculture?—What I referred to was, the work which has been lately done by the State of Alabama, and what has been done by the State of Alabama might, with advantage, be done by every State. The general Geological Survey of the United States was only recently organized, and is just getting into working order, and is bringing under its general system all that had been done by the independent State Surveys, in the different regions, and to connect it with the Territorial Survey, which has always been under the charge of the Federal Government. A proper study of the great coal and iron fields, of the great Appalachian coal and iron regions, requires a Survey extending over many States, and hence the desirability of making it the work of the Federal, rather than of the State Survey.

Q. The point that occurred to me was, that they would be to the same extent doing the same work?—I have consulted with the Director of the United States Geological Survey on many of these points. Whether the Federal Survey will attempt to discuss the agricultural questions, as has been done in Alabama, or leave them to the Bureau of Agriculture, is a question for the future.

Q. Can you state where, in your opinion, the line should be drawn? How far should the Geological Survey go in these matters and what would more properly belong to the Department of Agriculture?—The Geological Survey should occupy itself with all matters touching physical geography, the nature and origin of the soil, their relation to the rocks below and their relation to drainage and water supplies, as to whether the soils are stratified clay or sands, &c., and as to the question of the waters which may be got by sinking wells or boring. Since, in some regions like the North-West, where water supplies could be got by sinking wells or boring, it would be important to know whether fresh or salt waters fit for irrigation or domestic use could be obtained. Then there is also the question of the selection and

rotation of crops, the adaptation of particular soils to particular crops, manures and experiments in cultivation, which should be left to an Agricultural Bureau.

By Mr. Baker:

Q. Is it generally known that the geological or mineralogical works of the United States, such as has been exhibited here to-day, are bound in cloth and procured for the small sum of 50 cents?—They send out circulars to everybody who they think will be interested in knowing this fact. They also advertize it in the *Engineering and Mining Journal* of New York; I saw the advertisement in several places, and then every copy that goes out has a fly leaf, upon which is advertised the price of the work.

Q. How do you think the mineral statistics of the United States compare with the immigration statistics, as regards reliability?—I cannot tell as regards that. I know there has been some dispute about the correctness of their immigration, but I know that these mineral statistics are prepared with a great deal of care in the different parts of the country, and I know a great many of the men who are employed in the work. There is a report on the phosphates of South Carolina, by Mr. Moses, who is on the spot and has collected all his figures with care and skill. I know also that the iron and steel statistics for Pennsylvania were carefully collected by Mr. Swank, the Secretary of the Iron and Steel Association, who has for years made it his great work to become informed upon everything relating to the industry, with reference to the production for the iron masters, so that these statistics will be most trustworthy.

Q. You stated that the work performed by the Geological Department of Great Britain takes more of the nature of topographical work?—Yes.

Q. Are not the mineral resources taken charge of by some other department?—No; except so far as collecting the statistics. There is now a Mining Inspector under the Home Office. I have received a letter from Mr. Robert Hunt, late of the Mining Record Office, dated 20th October last, in which he says: "The Treasury last year awakened to the fact that two departments were doing the same work, and that mineral statistics were published in duplicate. After some long considerations it was determined that my office (the Mining Record Office) should be abolished and the business of obtaining returns from the mines should become a part of the duty of the Inspector of Mines, under the direction of the Home Office. This arrangement has been carried out; my two assistants have been transferred to the Home Office, and I am retired on a special pension. The work which has hitherto been done by me, and under a strictly voluntarily system, is now to be carried out with the power of an Act of Parliament with the twenty-six inspectors and my two clerks." This Act of Parliament was only passed last year.

Q. You made reference to the Geological Survey of California, and that it had been preceded by the Mineralogical Bureau. How much was expended in the old Geological Survey of California and how long did it continue?—I cannot tell you; it continued for seven or eight years. It was not satisfactory, however; the Director spent large sums of money on topographical and general preliminary surveys, while little or no attention was paid to the economics, such as gold, coal and quick-silver, and the mineral wealth of the country generally.

Q. But the expenditure of the Survey was paid by the Federal Government at Washington?—No; by the State of California. It is only within the last two years that the Federal Government have attempted to interfere with State Surveys. They had previously to do with the geological work and the mining resources of the Territories west of the Mississippi. But the State of California was for many years the only organized State west of the mountains, and the Geological Survey was entirely independent of the Government at Washington, just as much as the State of Alabama was.

Q. With regard to our own Geological Surveys, I understand that you are of opinion that the functions performed by it are not as practical as they might be, and that the greater part of the work is lost sight of by topographical or superficial work?—I suspect that to be the case; I do not know to what extent topographical work has

been done, but I conclude that considerable money is being expended in work of that kind.

Q. But you are of opinion that the geology, of a topographical nature, and the geographical explorations, should be dispensed with, and the attention of the department more directed to mineralogy and metallurgy?—The former should be, in my mind. For instance, along the lines of railways, or where branch railways are projected, or settlers are to go, exploring parties should make careful geological investigation, and with larger means and facilities, I would recommend an extension of that work. With reference to the Canadian Pacific Railway, for example, it would be very desirable to get accurate geological information along that line, and help to work out the geological structure of the country and give immediate information to the settlers who are going to settle along the line. But I am not prepared to speak with authority, because I do not know accurately the extent or the nature of the work being done there.

Q. Then you are of opinion that greater attention should be paid to mineralogy, metallurgy and economic geology than heretofore?—Yes; to mines, building materials and the raw materials of the soil, of economic value, and the best modes of utilizing them, and the relations of that soil to agriculture.

Q. You have said that inasmuch as the head of the Survey had not sufficient knowledge of the different questions which must come before him in his capacity as Director, that he could not carry out an intelligent scheme of geological work?—That is my opinion.

Q. Then you are of opinion that the head of the Geological Survey should be possessed with all the qualifications necessary to enable him to form an opinion on every particular subject that comes under him?—Yes; in everthing except special questions, which should be referred to some specialists; but when any question comes before him relating to rocks, ores or minerals, he should have sufficient knowledge of the subject to give an intelligent opinion.

Q. Do you not think that much unplesantness in departmental matters would not have arisen, and could not possibly yet arise, if the Director were to call his assistants together and take them into his confidence and consult them upon matters relating to the work of the department; for instance, they might have Board meetings?—I think he should most undoubtedly consult his subordinates, but I do not think there is any necessity for Board meetings. There are special questions with regard to paleontology, lithology and chemistry, in which the Director must consult his chemist, his paleontologist, or his lithologist, but he should have some general knowledge of all these sciences.

Q. Do you not think that greater satisfaction would exist and more work be obtained, and more zeal displayed in the Geological Survey, if not only the chief officer, but even his subordinates, were better paid? Do not scientific men command a higher rate of remuneration than the present staff are receiving?—Most undoubtedly they do. When I left the Survey I was consulted in the matter, and I said that I might perhaps be able to give an unprejudiced opinion on the subject, as I was no longer connected with the Survey. I said that Dr. Selwyn's salary (which was then $3,000) should be raised to $4,000, and the others proportionately; his salary was raised, but I think that the salaries of his subordinates were not.

By Mr. Lesage:

Q. I understand that you think it important that more atttention should be paid by the Geological Survey to our mineral prospects?—Yes; they have devoted all their attention to mere geological detail; of course, I would not neglect the collection of data bearing upon the geological structure of the country, but I would do as much of it as I could, not leaving the other undone.

By Mr. Baker:

Q. With reference to mining investigations is it your opinion that they should be made either according to sections or according to subjects, and that when a man once commences the work of a particular section he should be allowed to carry it on until it is completed?—Most certainly; in taking up a new subject or new field, much time would

be devoted to mastering the details of it and preparing men for usefulness in that particular line, advantages which would be lost if he were taken to another field. Dr. George Dawson went over to Europe recently to look into the question of the brown coal in Germany and Bohemia, and if he had followed that up it would have given us results which would have been of immense practical value to the country. By sending a man into one field one season and into another the next, even though he may be most zealous in working up the material, the work gets disconnected and he loses the thread of it, and the great part of the skill and knowledge acquired in one region is lost.

Q. That must be attributable to a defect in the directorate?—Certainly it is.

By the Chairman:

Q. I would be glad to get your views upon the sub-division of Dominion and Provincial attention to geological subjects and mineral resources and statistics, as illustrated by similar sub-divisions between the Federal and State authorities of the United States?—This centralizing system now adopted for the actual Geological Surveys of the United States will eventually efficiently supplant the work of the State Surveys. You cannot discuss the economic value of a coal field without you take in the whole of that coal region. Some coal fields extend through Pennsylvania, Ohio, West Virginia, Tennesee and Alabama, and therefore the discussions on these coal fields are of value just as they go into the question, irrespective of States. The old State Surveys have done a great deal of excellent work, and I have pointed out what has been done in Alabama and California, to show what single States might do for themselves. More might be said of the work of New York, Pennsylvania, and New Jersey. They have stations of the United States Geological Survey at Washington, Newport (Rhode Island), Denver (Col.), and within the last few months another in San Francisco, which might perhaps unite with and take the place of the State Mining Bureau. I have referred to these merely to show the way in which the question presents itself to the people of Alabama and California, and to show how this local work, so excellently conceived and so well carried out, will not be done away with, but simply carried out on a larger scale by the Federal Authorities.

Q. I suppose the present State Survey will become subsidiary to the Federal Surveys?—Yes; to the greater advantage of geological science. The consolidation of the State Surveys with the Federal Survey now going on in the United States is going to contribute very much to the progress of geological science and to the development of the resources of the country, and the ecffiiency of the State Surveys are undoubtedly enhanced by it. Here we have one Survey extending from ocean to ocean and splendid conditions for carrying it out, following in the way that is being so successfully carried on in the United States.

HOUSE OF COMMONS, OTTAWA, 20th March, 1884.

The select Committee on Geological Surveys met this afternoon, Mr. HALL in the Chair.

J. FRASER TORRANCE, Esq, of Ottawa, was called and examined.

By the Chairman:

Q. You have been connected with the Geological and Natural History Survey of Canada?—Yes; from May until the end of February of this year.

Q What were your previous qualifications and experience to fit you for work on the Survey?—I was educated at McGill University, where I took the degree of B.A., and B.A.Sc., and I have studied for two years in the Royal School of Mines in Freiberg, Germany. While I was there I was engaged by the Borneo Company to undertake the management of their mines. A fortnight completed my term of work there. I was struck with jungle fever and was some two years recovering from the effects of it. Since then I have been engaged in professional work in many parts of Canada—in the Chaudière gold fields, and in the Nova Scotia gold fields where I

was in the mines for two and a-half years. I also visited British Columbia, professionally, on two occasions.

Q. These engagements were for private Companies?—Yes. I may also say that I am a member of the American Institute of Mining Engineers.

Q. What position was assigned to you in connection with the Geological Survey?—Last spring I came here specially to see Dr. Geo. Dawson, about further work in British Columbia, and to get some information about the regions there, and while here Dr. Selwyn enquired if I was engaged, and proposed that I should join the staff of the Survey, to examine the phosphate fields of Ottawa County. I was inclined to refuse this offer, because I was aware that it was the most difficult geological field in the whole Dominion, but I finally consented, and so, although I warned Dr. Selwyn that I did not think a season's work there would do any good, he told me that some one must go, and he did not know anyone else in Canada who was prepared or qualified to fill the position, and he was very anxious that I should do so, and promised that he would not find fault if it took four or five years instead of one or two, to arrive at any satisfactory result. On that understanding I undertook the task and proceeded to Montreal, by Dr. Selwyn's directions, to see Mr. Vennor, who was previously engaged in the same field of work, to obtain maps and any information which I could get about the field. Mr. Vennor's last four years of work had not been reported upon officially. When I returned to Ottawa to obtain instruments for my work, Dr. Selwyn armed me with an old broken-down compass, not even a prismatic compass, which he said was quite as good an instrument as was required for the geological work of Canada; but it had lost its magnetism. I protested, but went into the field. Later in the season I was furnished with a suitable theodolite. I was in the field until the middle of October; I had a Mr. Howard with me, and two axmen, most of the season. Mr. Howard is a graduate of the McGill School of Science. Dr. Selwyn now complains that my expenses in the field were too heavy, but he does not state that my salary and those of my assistants were all charged in the field explorations. My expenses were $300 less than the limit allowed me by Dr. Selwyn before I began.

Q. You returned to Ottawa about the middle of October?—Yes. Dr. Selwyn had not yet returned, and there was a little uncertainty as to what office I was to use during the winter, or where I was to prepare my plans, and nothing was done until Dr. Selwyn returned, at the end of that month or the beginning of November.

Q. Upon going into the field in the spring were you furnished with detailed instructions from the Director?—My instructions were merely verbal, and on my return he denied having issued many instructions which I had received from him. He said, for instance, he had no idea as to why I had gone to Montreal or what my object was, and when my accounts for the season's work were made up, he accused me of defrauding the Government, by charging $7 for my ten days' stay in Montreal. He said I was living at home, and I told him that he knew more about my domestic arrangements than I did myself; it was many years since I had had a home in Montreal. Of course, that was not calculated to promote harmony.

Q. Upon his return, on the 1st of November, were you assigned an office, and did you commence the preparation of your maps and report?—Yes; as soon as his return, an office was assigned me and I began my work. The specimens were unpacked and relabelled, and the plotting of the plans and surveys were commenced.

Q. What progress had you made with your plans when you severed your connection with the Survey?—My plans were far advanced and my report was partly written when Dr. Selwyn gave me to understand that my work was of no use and that he had not attached any importance to it and he did not wish me to continue my connection with the Survey, and that as soon as my report was submitted he wished me to seek other fields.

Q. At that time he had not seen your report?—No. When I learned that he wished me to seek for other employment I thought it was very important for me—as my pay had not been sufficient to accumulate any reserve fund for a season of idleness—that I should at once get another position. As for the report, I thought it

should be submitted to him when I had my plans prepared, and that report is to be submitted before I leave Ottawa. I have been working at it since. My official connection with the Survey continued up to the end of February. Dr. Selwyn wished me to leave sooner, but as it was the end of January I required a month's notice, and I retired at the end of February. I have the correspondence here. The first letter in this correspondence was submitted to me on the 27th December, 1883. At that time I was credibly informed that Dr. Selwyn wished me to retire, to make room for an English engineer, who had just arrived, and that if I wished to secure an appointment under the Government I had better make an official application. The first letter is as follows:—

"OTTAWA, 27th December, 1883.

"DR. A. R. C. SELWYN, F.R.S., L.L.D., &c.,
"Director of the Survey.

SIR,—I beg leave herewith to submit proposals for reviewing the collections of mining statistics, under your authority; which subject has already been briefly discussed with you by Mr. Hoffman and myself.

"Perhaps the best plan to pursue would be to divide our economic minerals into several groups, for instance;

"(1.) Apatite, gypsum, salt, and asbestos.

"(2.) Iron, and manganese.

"(3.) Lead, copper, zinc, and antimony.

"(4.) The precious metals.

"And report as fully as may be possible on one of these groups each year, with a general synopsis of all available information about the other groups. Thus, each branch of our mining industries would be reported upon with more or less fullness, once in every four years, and an approximately correct record would thus be kept of the development of our mineral resources.

"I have purposely omitted coal from this arrangement, as Nova Scotia and British Columbia both undertake the publication of the statistics of their respective coal fields; and the members of the staff in our North-West Territories will be engaged chiefly in work connected with the coal fields of that area. Therefore, no special report by me upon the coal mines would be of much advantage.

"In order to obtain reliable information, it would be highly advisable for me to personally visit, each season, the chief centres of the industries that are to be specially reported upon that year. In doing so, I would have opportunities to pay flying visits to other mines *en route*, and collect necessary statistics for my—(rest of copy is illegible, but I think the termination is simply)—annual synopsis.

"I have the honor to be, your obedient servant,
"J. FRASER TORRANCE."

Finally, Dr. Selwyn, writing to me on another subject, informed me that the time for considering the question of mining statistics had not yet arrived. This letter was dated 28th January, 1884, and in the course of it Dr. Selwyn said: "As regards your letter of the 27th December, which was duly received, it refers to a subject which requires consideration, when the time arrrives for doing so." I wrote to him again in reference to that subject, on the 30th January, 1884, as follows:—

"OTTAWA, 30th January, 1884.

"DR. A. R. C. SELWYN, L.L.D., &c.,
"Director of the Survey.

"SIR,—Although I am reluctant to allow personal considerations to enter into an official correspondence, I cannot help regretting that the time has not yet arrived for considering my letter of the 27th ult.; as the arrangements of quite a number of people, besides myself, depend to a large extent upon the decision finally arrived at.

If you would give me an idea when the time for decision is likely to arrive, I would be very grateful for the information.

"Yours obediently,

"J. FRASER TORRANCE."

Dr. Selwyn replied as follows:—

"GEOLOGICAL SURVEY OFFICE, OTTAWA, 30th January, 1884.

"DEAR SIR,—In reply to your letter of this date, I may say that the matter referred to in your letter of the 27th ult. will certainly not be considered till the Estimates are passed.

"Of course, your employment during the past summer was only of a temporary nature, and the result has not been such as to induce me to think your services could be continued with advantage to the Survey. I should, therefore, advise you to seek other employment so soon as the work you are now engaged on is completed.

"Yours truly,

"(Signed,) ALFRED R. C. SELWYN.

"J. FRASER TORRANCE, Esq., Ottawa."

When I received that notice to retire I personally sought Dr. Selwyn to remonstrate with him on the subject, and asked him if he discharged me for incompetency, to which he replied that I was the last person in the world to charge with incompetency, and the only reason for my discharge was that the temporary work for which I had been engaged was finished. "Oh," I said, "it appears evident that you are engaging extra men," to which he replied that he had spoken to me about draughting plans and that I told him I was no draughtsman. I never did so, and it would have been an absurdity for me to have done so after the training I had received. I replied to his letter on the 1st of February, as follows:—

"OTTAWA, 1st February, 1884.

"DR. A. R. C. SELWYN, LL.D., F.R.S., &c.,
"Director Geological Survey.

"SIR,—It puzzles me to understand how you received the impression that you had spoken to me repeatedly about draughting plans, and that I had informed you that I was no draughtsman. It is my firm belief that no such question was ever discussed between us, but I have talked to Dr. Bell about the draughting, and he may have spoken about me to you. He once asked me if I was a good draughtsman. I replied that I had not had much practice since leaving college, but that when my report was finished I would try my hand at it for him. I must beg leave to assure you most positively that I never refused to undertake draughting; on the contrary, I have always held myself ready to undertake any work that you chose to assign to me.

"It is satisfactory to learn from you this morning that your letter of the 30th ult. was written simply because the temporary work for which I was engaged is nearly finished. I am applying to the Local Government of British Columbia for a professional engagement, and I hope to find congenial work in that Province. If the impression got abroad that I had been discharged for incompetency it would do me very grave professional injury. But I am very glad to be able to refer to you for evidence to the contrary.

"I am, yours obediently,

"J. FRASER TORRANCE."

That letter remains still unanswered, though I suppose he has found no fault with the contents of it. This question of collecting mining statistics has been submitted to Dr. Selwyn, and before it was submitted I had a conversation with Mr. Hoffman, who holds the position of Inspector of Mines, and who assured me that my usefulness would be greater in professional work of this sort, than in this field work

that I had been engaged upon during the past season. I spoke to Dr. Selwyn about it, who even went so far as to nominate the assistant who should carry out the scheme, who was to be Mr. Coste. Dr. Geo. Dawson was also present at the conversation and seemed to agree with the scheme. This correspondence shows that the views of some people have changed considerably. I told Dr. Selwyn, at that time, that I did not think I was well qualified for work as a field geologist, that I had not the necessary training, and that it was not very congenial to me. He said that he did not want me to work as a field geologist, but for me to go into the field and collect the facts, and he would attend to the field geology in the office.

Q. An impression prevails that there is a meagre result from the large expenditure of over $90,000 per annum, in connection with the Geological Survey, and the object of this Committee is to ascertain if that impression is correct, and if it be correct, whether or not the defects in the Survey result from the system under which it is managed or its administration under that system?—The expenditure is certainly very large for the results accomplished, if they are shown by the published volume of the last few years, but a great deal of very valuable work has been done on the Survey which does not appear in the volume at all There has been a great deal of work done by Mr. Webster in the Eastern Townships, and there are maps in the office showing the careful way in which he has made his surveys. Dr. Selwyn, in the preface to the report of 1880-81-82, devotes a considerable amount of space, which he reserved in quoting from Mr. Webster's report. From the quotations he furnishes, it is very evident that the whole of the report has been of great value. In the notice of the geology of the south-eastern portion of the Province of Quebec (A and following pages), he refers to some remarks of Mr. Webster's, and he goes on with that quotation of Mr. Webster's for two or three pages, as to the gold of that region. The economic portion of it was entirely furnished by Mr. Webster. The work of Mr. Fletcher has been entirely overlooked in Nova Scotia and Cape Breton, although that region is rapidly growing in importance, as to its mining resources. Large quantities of American capital, I am informed, are constantly going into that country.

Q. When was the wo rk done.there by Mr. Fletcher?—He has been engaged in that region for a number of years. Of course, all this work has been paid for out of that appropriation, and if it were known to the public, they might consider that the appropriation was not wasted. Mr. Vennor's work, for four years, has never been published; in fact, I do not think the report was handed in to the Director.

Q. Was that the fault of the system, or of Mr. Vennor himself?—I am not aware. I merely refer to the fact that no report is available for four years.

Q. So that it is actually lost to the public?—Yes.

Q. Are there defects in the system under which the Survey is managed?—I cannot speak on that point, because I am not aware of any system. No rules are laid down by Dr. Selwyn for his own guidance, or for that of his assistants.

Q. Lack of system, rather than anything else?—Yes. I know that the instructions he has issued to me and others, have been absolutely contradictory to instructions given previously, so that it does not seem to me that there is any system in the matter. It is a government of caprice.

Q. Is the administration satisfactory. By that, of course, I refer to the personal supervision by the Director; the instructions that he gives, and his personal relations with the staff?—The administration appears to me to be very unsatisfactory. Dr. Selwyn will, for a week, appear to devote his entire energies to watching the work of one particular member of the staff, and then perhaps let months pass without saying a word to him, and concentrate his attention upon somebody else. The results are very unfortunate. I am aware that Dr Selwyn has a difficulty in distinguishing between the junior members of the staff, although they have been there for several years. He does not know whether they are working with Dr. Bell, Dr. Dawson, Mr. Ells or Mr. Fletcher, so that it is not easy to supervise the work, when he is not aware of the work they are supposed to be doing.

Q. Speaking generally, are the relations between the Director and his staff friendly or otherwise?—At the present time they are decidedly otherwise than friendly; in fact, bitter feeling exists between him and almost every member of the staff.

By Mr. Baker:

Q. When were you first appointed?—My appointment dates from the 21st of May, 1883.

Q. And at that time were you given to understand that your employment was distinctly of a temporary nature?—Not at all. Dr. Selwyn spoke, at that time, of continuing my explorations four or five years, before any definite results could be expected.

Q. Did you receive from the Government or from the Department your regular appointment?—Not at all; I was paid out of the general field exploration fund.

Q. Did you receive your instructions in writing, previous to going on this exploration?—No; everything has been verbal and also contradictory.

Q. Were you paid the same rate of remuneration as gentlemen of your training and position usually demand, or in keeping, at all events, with what other officers received when doing similar work?—Yes, Sir; not quite to be compared with the American pay, but it was the same as the others on the Survey.

Q. Were you regularly dismissed by Dr. Selwyn by letter?—Oh, no; the season was getting too much broken, and I came to report myself at the office.

Q. Was it at that time that Dr. Selwyn led you to believe that your usefulness was gone?—Oh, no; it was not until the middle of December. On my return from the field he received me very friendly, but before many months it was a sort of chaff with those around me that I was to be the next victim, but it was some time before it dawned upon me that he wanted me to leave.

Q. You were, so to speak, his pet aversion for a time?—Yes; when I first joined the staff I was looked upon as a favourite of his, and much to be envied by every gentleman who had been on the staff for a long term of years, but when I came back they did not envy me so much.

Q. At the present moment, are you supposed to be receiving pay?—No; my pay ceased at the end of February.

Q. Then you had a formal notice?—At the end of January. I accepted the notice and proceeded to look for work elsewhere, and on the 31st January I wrote the following letter:—

"Ottawa, 31st January, 1884.

"Dr. A. R. C. Selwyn, LL.D., F.R.S.,
"Director of the Survey.

"Sir,—Your letter of yesterday's date only reached me this afternoon. Its contents are duly noted. Accept my thanks for leaving me no longer in uncertainty as to your intentions towards me. As I am engaged by the month, I must leave the service by the end of February, but perhaps you will kindly grant me leave of absence after my report is finished, to enable me the better to seek for other employment.

"I am grateful to you for the friendly intentions with which you invited me to join your staff last spring. As events have transpried, I am sorry I did not absolutely decline your kind offer. The results have realized my worst anticipations.

"I went into the field without much experience and no suitable assistant. Since my return, the worst construction has been put upon my every action. Whenever I write a letter it is supposed (without enquiry) to be on private business, &c., &c., but I am not going to try to justify myself.

"And I would be very sorry to write anything to still farther embitter our relationship. It really pains me to think that we cannot, when our official relations are abandoned, resume the former friendly relations, which I value very much.

"Again thanking you for your prompt reply,

"I am, yours obediently,

"J. FRASER TORRANCE."

Q. Then this letter of the 30th January gave you your dismissal?—I understood it so.

Q. And you accepted it?—Yes.

Q. Then how can the Department expect you to make up reports?—I think I am in duty bound to do so, because part of my time was spent in looking for work instead of finishing up the report.

Q. In fact, your work is not complete until your report is in?—No. I may say that this notice of my dismissal took Dr. Geo. Dawson, who, to a certain extent, was interested in my appointment of the previous spring, completely aback, and Dr. Dawson said the result would be that a green hand would have to be sent into the field and have to serve his apprenticeship there, at a loss to the Government.

Q. So, that as far as the geological work which you did there during that season is concerned, it is simply thrown away?—Yes; to a large extent. A great deal of the information which the geologist gets in a region the first season is a general knowledge, and cannot be embodied in the report. It shows him how best to guide his men the next season. That is the reason why the usefulness of a man is valued, to a great extent, by the length of his service. In speaking to Mr. Frank Adams about the Laurentian country, he remarked that it was very unfair to ask any man to make a report after one season's work in a new field, because of there being no fossils there and the strata being disturbed. It is difficult to obtain sufficient data in one season on which to base a report. In fact, men going into the Laurentian field now-a-days, as they cannot depend upon fossils in regard to the structure, they ought to be accustomed to the microscope, and be assisted by chemical analysis and microscopical work as they go on. Otherwise, the work is apt to be misleading and erroneous.

Q. Have you ever made any reports to the Geological Department concerning British Columbia?—No.

Q. So that all the information you obtained out there is your private and personal property?—Quite so, and the same in Nova Scotia and the Province of Quebec.

Q. To what reason do you yourself mainly attribute your so-called dismissal?—I cannot give any definite reason for it. I would like to submit to the Committee a very interesting article by Mr. S F. Emmons, of the United States Geological Survey, which has been published in the tenth volume of the transactions of the American Institute of Mining Engineers. The title of it is "The Mining Work of the United States Geological Survey." It speaks of the division of the country into areas, with local centres, under the charge of assistant geologists, and then he speaks of the Survey work now in two branches—one general geology, and the other mining geology—which will independently and mutually assist each other and that in each division there should be a distinct corps in each of these branches. Mr. Emmons, in the course of this article speaks as follows: 'In earlier Government surveys, which were topographical reconnaissances in a practically unknown region, geology occupied a secondary and unimportant position. With the Fortieth Parallel Survey, inaugurated in 1867, and its successors, the Hayden Powell, and Wheeler Surveys, geology became an essential object of the work but owing to the want of already existing maps, topography necessarily absorbed a large portion of their labour and funds. Even these, however, were rather of the nature of geological reconnaissances than of surveys properly so called—the conditions of the work demanding that a given superficial area should be covered each year, without allowing time for complete and thorough investigation of any particular class of phenomena, or series of deposits. Their labours had, nevertheless, furnished an adequate knowledge of the general geology of the great Cordialleran system in the United States, as well as general topographical maps of an area sufficient to serve as a basis for more accurate and detailed studies, which might occupy, for a number of years to come, all the force which could be employed with the funds Congress would probably be willing to appropriate. Therefore, instead of continuing the reconnaissance work over the remaining unexplored area, it was decided to make detailed monographs of particular districts in the region thus partially known, for the purpose of illustrating geological phenomena of special interest, and thus giving time for

topography to precede geology, as it properly should, in the, as yet, unmapped regions. An important change in the manner of carrying on the geological work, introduced by Mr. King, was that of dividing the country into departments, or divisions, over each of which should be placed a geologist in charge, with an office at some central point, to whom, under the general supervision of the Director, was intrusted the entire responsibility of planning and carrying out the work in his division, and the choice and general direction of his assistants. This change was favourable both to efficiency and economy, since by it the annual expense of transferring large parties from Washington to the field was avoided; and the employees, becoming more and more familiar with the character of their particular district, could work up their material in the immediate vicinity of their field of labour, and would be enabled to do more rapid, and at the same time more accurate work. In pursuance of the idea that more attention should be given to the practical application of geology, to the development of mining industry, the work of the Survey was distributed under two main heads—general geology and mining geology—which, while independent, should mutually assist each other. In time, it was intended that in each division a distinct corps should be occupied in each of these branches, whose combined labours would result in giving us not only a geological map of the whole country, but an intimate acquaintance with its mineral resources, and some definite knowledge in regard to the vexed question of the origin of ore deposits. In the two field-seasons that have elapsed since the adoption of this programme, with the limited funds appropriated for the use of the Survey, necessarily but a small proportion of the work contemplated has been accomplished. Nevertheless, a number of monographs are now in process of publication, which will, it is hoped, prove the wisdom of the programme above sketched. Their possible field of usefulness will certainly be enlarged by the fact that they will be procurable by all who desire them, at the cost of publication. The work of the mining geologists of the Survey is that in which the members of the Institute will naturally feel the most direct interest. As a brother mining engineer, I feel that it may not be inappropriate for me at this time to give some account of the manner on which that portion of the work intrusted to me has been carried out, in accordance with the above general programme, and to offer to your consideration and criticism my idea of the principles and aims which should govern such work. The mining geologists of the Government should, it seems to me, bear to the mining engineers of the country a somewhat similar relation to that which the latter held to individual owners and the mining public at large. The duty of the mining engineer towards his employer, the actual or prospective owner of a mining property, is to place before him, in an intelligible manner, the character, mode of occurrence, and probable quantity and value of the mineral deposits which his property may contain, and the best method of utilizing them. The duty of the Government mining geologist, whose field of observation is wider, and whose facilities for carrying on work are greater, differs only in this, that his views should be more comprehensive and his study should take in the general interests of a group of mines or of a whole mining region, rather than of a single mine. In neither case, however, can trustworthy results be obtained, except they be founded on a sound and accurate knowledge of the geological structure of the region in which the deposits are found. In coal deposits, it is true, the necessity of a geological basis for reports has long been generally recognized, but in respect to metallic deposits, how many of the hundreds of mining reports that are made every year in this country have any foundation of actual geological data? But few indeed. I have been forcibly struck by this fact, in the course of my investigations, when I have endeavoured, by the study of reports on regions I had not yet visited, to obtain some definite idea of their geology. Nor is this true only of this country; it applies, also, though perhaps in a less degree, to older countries. Look even at the classical work on ore deposits of our respected Von Cotta, which is a compilation made by a man whom we all acknowledge to be thoroughly competent of the best scientific data obtainable at the time he wrote. How little satisfactory information can be gathered from it, of the actual geological relations of the deposits described. Why is this? And in what way should it be remedied? If we ask the mining engineer

why he has not given more geology in his report, his answer will probably be: first, that nothing has been published on the geology of that region; second, that the persons by whom he was employed desired practical results, not theories. Of the two reasons thus given, the first is certainly a valid one, and the want of published, data is one which it should be the first duty of the Geological Survey to supply. The second is the expression of a prejudice, unfortunately too common in the public mind, in favour of practical as opposed to scientific mining—a prejudice for which mining engineers as a class are partly responsible. Fortunately, this prejudice is gradually disappearing. Ten or fifteen years since it was so strong that the fact that a man was a graduate of Freiberg or other European mining academy, was almost sufficient to bar him from employment in a western mine; while to-day, in Leadville, among the most successful miners and metallurgists, are found prominent names of graduates of Freiberg and other European schools, such as Eilers, Meyer, Grant and others. Nor is this prejudice confined to untechnical men. Many mining engineers, while freely admitting the necessity of a geological basis for determining the value of coal, iron, petroleum, and allied deposits, consider it at best, in the nature of an ornamental or decorative addition to a report upon metallic mines. In my opinion, however, there is no inherent reason why, with sufficient study and investigation, the geological relations of metallic deposits should not be determined as accurately as those of coal and iron. The subject, it is true, presents greater difficulties, and in the rapid advances of geology at the present day, the geologist and the mining engineer have been pursuing somewhat divergent paths—the former confining himself more and more to special branches of theoretical study, and the latter to the technical and mechanical side of his profession. In Prosepuy's excellent work, *Archiv der Geologie*, a chapter is given (*Geologie und Bergbau in ihren gegenseitigen Beziehungen*), deprecating this tendency, and outlining in some detail the official work done at present, in both branches by civilized nations. It behooves us, then, it seems to me, not only as geologists, but as mining engineers, to give greater importance to geological structure in our reports and papers on metallic mines; and this, not only for the purpose of removing the above named prejudice, but for the sake of accumulating matter which shall, in time, afford us the means of rendering to ourselves as satisfactory and definite an idea of the manner of the formation of metallic deposits, as we have at present in the case of coal." It is one of the most important things that our Geological Survey could devote their attention to; the origin of the ore deposits, the relation of the metals of the country, the laws of deposits, whether they are richer or within certain zones of rocks or poorer, and so on. Such investigations are considered now, by foreign geologists, as likely, in a very short time, to lead to great practical results.

By Mr. Wood:

Q. I think you stated that your report would be submitted in a few days?—Yes.

Q. And that you have done work in British Columbia?—Yes.

Q. How were you engaged there?—In 1878 I was sent out there by some gentlemen in Montreal, under the instructions of Sir Alexander Galt, and associated with him were Mr. Geo. Stephen, Mr. R. B. Angus, Hon. D. A. Smith, and some fifteen or twenty other gentlemen, with instructions to go out and report on a precious metal mine there. They intended to organize a company and engage in work there.

Had you any interest in the speculation?—Oh, yes; I was to receive a percentage on the products, in addition to my salary as manager.

Q. You have no such connection at present?—No. While I was connected with the Survey I had no financial connection with any mining enterprise.

Q. In regard to your plans for the future: are you looking forward to following mineralogy as a profession, or with the view of speculating?—Recently I have secured patents for improved methods of protecting boilers from the loss of heat by the use of infusorial earth, and the manufacture of fire bricks out of the same material, and I intend to give my attention to these patents.

Q. This work would appear to belong to one who followed geology as a profession?—I think so.

Q. There was nothing of that kind which could have influenced Dr. Selwyn while you were engaged in the Geological Survey. I mean your connection with anything of that kind?—Not that I am aware of. There is no regulation in existence in regard to gentlemen securing patents for such inventions. I may say that the staff of the Geological Survey of the United States is bound by the laws of the country to have no interest at all in any mines or minerals, which, I think, is a good regulation. At any rate, a gentleman's sense of honour would suggest it to him. I am not aware of any person connected with the Survey having any interest in any minerals, and if they had had such, I would have been very apt to have heard of it while outside of the Survey, because many of them I have known for several years.

Q. You are not open to any charge of that kind?—No.

By Mr. Baker:

Q. Was not your predecessor, Mr. Vennor, discharged from the service for having something to do in connection with a phosphate company?—I am not aware of any such connection.

Q. But was that not the belief?—I am not aware.

Q. Those gentlemen to whom you referred to in Montreal did not treat you any more handsomely than the Geological Department?—They treated me well; it was on this last trip, but none of these gentlemen had anything to do with it. In 1878 every obligation that was undertaken was fully discharged, although the work that I did did not lead to the permanent employment that I had hoped for, although I do not blame any of them for that. With reference to the reports, I would suggest that the method should be followed of making these reports sectional. A man interested in Cape Breton does not want to hear what is going on in the North-West or British Columbia, and they ought to be reported on separately and the volumes sold at a nominal price. I think also that the gentlemen in charge of the different Provinces ought to be promoted to the position of assistant directors, which their long service and training qualifies them for, and which would place them on the same footing in every part of the Dominion, and that gentleman should be held responsible for the work, and that the credit for that work should belong to him instead of to the Director. If this were done, there would be more *esprit de corps*, and a greater sense of responsibility in the department than there is at the present time.

HOUSE OF COMMONS, OTTAWA, 22nd March, 1884.

The Select Committee on Geological Surveys met this morning, Mr. HALL in the Chair.

DR. T. STERRY HUNT, of Montreal, was again called and examined.

By the Chairman:

Q. A question was asked Dr. Hunt by Mr. Wood, the other day, as to what he would suggest with regard to the analysis of soils, and what division he would suggest between the functions of the two departments—the agricultural and the geological—in that respect; and, as Dr. Hunt has given some attention to the matter since, I think it would be as well for him to give the Committee his views upon the subject?—I would say that the work of the analyses of soils and sub-soils is one which should especially belong to the Geological Survey, because questions raised with regard to the origin and nature of soils and their classification in geographical areas can only be done by one familiar with the physical geography and geology of the country, inasmuch as it is this that determines the character and the distribution of the soils. There is also the question of the subterranean waters, as to their composition and their fitness for economic and for agricultural purposes, especially in some of the dryer regions of the North-West, where suplies of good water for domestic purposes and perhaps for irrigation are scarce. I think there are regions where irriga-

tion would be advantageous. Such questions ought to be chemically investigated by the Geological Survey, and these investigations should be done, therefore, by somebody having a knowledge of the physical geology of the regions to be studied. In that way, I think the Geological Survey could render important services to the agricultural interests of the country, and doing a work for which it is much better fitted than any special Agricultural Bureau that could be organized for the purpose. At the same time, the functions of such an Agricultural Bureau are very important in relation to the chemistry of fertilizers and their adaptation to special crops and to the questions of economic botany regarding forests and cultivating plants, and these should, in my opinion, be separate from a Geological Survey, and could, with advantage be transferred to an Agricultural Bureau, which, in my opinion, could best take up the work of practical natural history, which is now supposed to be included in the work of a Geological Survey, especially the very valuable work which Prof. Macoun is now doing, and which is of much importance to the forestry and agriculture of the country, and which might properly belong to an Agricultural Bureau rather than to the Gdological Survey.

By Mr. Ferguson:

Q. You would separate the analysis of the fertilizers from that of the soils? You would attach one to the Agricultural Bureau while the other would be attached to the Geological Survey? Would it not be in the interest of the country, from a financial standpoint, that both of these should be under one Department?—It would require a special chemist, perhaps, to look after that. A man who undertakes a systematic investigation of the soils of the country cannot, without loss of time, be called aside to make an sasay of fertilizers, because the analyses require the different methods, and there should be no interruption of the regular course of investigation.

Q. Still, could not other officers be attached to this part of the Survey, so as to save expense?—It could be done, but yet I would say that in the organization of the Geological Department there are other chemical questions which come up, in regard to milk, butter, cheese, the examination of the disease of live stock, &c., and there would have to be a sort of laboratory to work in, which could scarcely be connected with the Geological Survey. The examination of mineral fertilizers ought to belong to the Geological Survey, except when it comes to the question of commercial analysis, which must be the work of local analysts. For instance, the commercial articles imported by way of Halifax, Montreal, &c., should be examined by local analyses, who should have control of that work, but so far as the general question of mineral fertilizers, which are likely to be important to agriculture, and the analyses of soils and waters, that might fairly be done by the Geological Survey.

Q. For instance, a man might exhibit a specimen of a fertilizer which might be approved of, but when he came to manufacture it, it might be a much inferior article. The question of producing a fradulent article thereafter would have to come under the criminal law and be summarily dealt with, I suppose?—You could not expect the Geological Survey to do that.

By the Chairman:

Q. Since your examination before the Committee you have devoted some time to an examination of the maps which were produced here by the Director, notably those in connection with the Eastern Townships. Would you give the Committee the benefit of your investigation?—I would say, with regard to the map of south-eastern Quebec, of which divers copies are distributed here, that the geology of this region, as it had been worked out in the previous twenty years by all the members of the Geological Survey, up to 1866, was delineated on the great geological map published by Sir William Logan in 1866. He then set to work to prepare for the publication of a map, on a larger scale, of this same region, which includes the Eastern Townships, and this was prepared in the office of the Geological Survey, and was engravee by Stanford, of London. A copy of this map, upon which Sir William had placed the geology of the Townships, copied from the map of 1866, was placed by me in the Paris Exposition in the spring of 1867. Subsequently, upon this map was made the basis of some further minor changes in that region by Sir William, but it

was never published. In 1870, I pointed out that there was some reason to doubt the geological interpretation of a part of this map. This led Sir William to make investigations to endeavor to satisfy himself whether he or I was right, which were continued nearly to the time of his death, but were never published. Dr. Selwyn tells us that Sir William wished to suppress this map and, from my point of view, I think that resolution was a wise one, more especially as Sir William's views on this subject had already been set forth in his map of 1866. So much with regard to the suppression, for which Dr. Selwyn was probably justified, and in which view I concur. Sir William had a perfect right to have it published if he wished, but it had already been published in available form, and the only question was, whether this was to be repeated. If he did not satisfy himself, as there is some reason to believe, it was better that the work should remain unpublished, and Dr. Selwyn says Sir William wished it to be suppressed. Another charge with regard to the map is, Dr. Selwyn having published as his own the work of others. Now, this map, as I say, was exhibited publicly by Sir William, after engraving, but was not published on account of these delays. In 1875, Dr. Selwyn allowed the firm of Walker & Miles to reproduce and publish it in this country as a topographical map, and to put thereon his name, stating "Prepared by the Geological Corps; Alfred R. C. Selwyn, Director." Had it been a geological map it would have been correct to say that it was the work of the Geological corps, as it was, it was only a map compiled in the office of the Geological Survey for geological purposes, and subsequently published without geological lines as a topographical map. This map, as thus published, had some unimportant additions only made to it after Dr. Selwyn's arrival in the country. The whole of the Eastern Townships, the more important part of the map, had been engraved two and a-half years before he came into the country. There were added to it undoubtedly a few outlines along the main boundary, and there were additions on the north shore of the St. Lawrence, but so far as regards the great tract of the Eastern Townships, which was the only important and difficult part of the map, it was engraved and publicly exhibited, though not published, two and a-half years previous, and therefore the charge made by some one before this Committee, that Dr. Selwyn published as his own a map which was not his work, nor yet the work of the Geological Survey, except in so far as the few outlines which were put upon it by the Geological Survey.

By Mr. Dawson:

Q. Then it was not his own map?—No, with the exception of some of the minor fillings up. All the important parts are the same as those on the map dated 1867, which I received with my own hand from Sir William Logan.

Q. And he took credit for work which he did not do himself?—I may say that Dr. Selwyn spoke to me about this the other day, and he said: "I am not answerable for that. The map was wanted for topographical and general purposes, and I allowed sheets from the original map to be taken and transferred, in the ordinary way, to be re-produced for that purpose. I gave no instructions and no orders as to what was to be put on the map; in fact, I was ignorant of what was put on the map, until after it was published, and am, therefore, not responsible for it."

Q. But he has seen it since?—He has never effaced it, which would have been very easy to do, with another piece of paper.

Q. This is not the same map that is being re-produced in England, is it?—It is the same, only another publication of it. The sheets were taken from the original map.

Q. The reason was, that Sir William had probably changed his views or was not certain as to the proper position of the rocks in the Quebec group?—Yes. Dr. Selwyn says that Sir William expressed a wish before his death that it should not be published, and in justice to Dr. Selwyn, I will say that I do not think he is to be blamed for keeping back the map as a geological map.

Q. Mr. Macfarlane expresses himself very strongly upon that subject?—I said to Dr. Selwyn that he should have had a written record of what Sir William told him, but he said: "I know I should, but I have not." I am therefore willing to take his

word, and I have reason to believe that Sir William was in great preplexity in this matter.

By Mr. Baker:

Q. Do I understand that you consider it was showing his wisdom, from a geological point of view?—Not his wisdom, but his respect for the wishes of Sir William Logan.

Q. You have every reason to believe that that wish was expressed?—I have no reason to doubt Dr. Selwyn's word, from any other source.

Q. But during Sir William's life-time you had opportunities of conversing with him. Did he express such a view to you?—Not in those last years during which Sir William was at work, because I was absent from the country.

By Mr. Dawson:

Q. But you never understood before that Sir William wished to have his map suppressed?—No, I did not; but Dr. Selwyn says it was so.

Q. So the suppression of Sir William's great work rests upon Dr. Selwyn's assertion as to his wishes?—Yes. There is also another reason. Dr. Selwyn, in speaking to me about this map, the other day, said: "I have satisfied myself, Dr. Hunt, that you were right, and Sir William Logan was wrong;" and therefore, Dr. Selwyn, of his own motive, might think it proper to suppress the map, but he would have no right to, except Sir William Logan told him to do so. Therefore, I am willing to believe that Sir William did tell him that, as it would show his wisdom, if he did.

Q. Sir William was in doubt himself as to the correctness of his map?—Sir William said: "I do not know whether I can go over the work of forty years; I am too old for that, I am afraid;" and then afterwards undertook to do it.

Q. Do you know what work is being done in the department at present in the way of maps?—I do not; I saw Mr. Ells plotting down his work in the Shickshock Mountains in the Gaspé region, where he seems to be doing very excellent work. I also saw a proof of a large map of the county, from the Plains to the Pacific, now being printed in Montreal and, as I judge, devoted to the distribution of the Indian tribes of the West, from the foot hills to the ocean, which could not be called a geological map.

Q. Of what use would that be to geology?—I cannot say; it shows the limits of their hunting grounds, and nothing else.

By Mr. Baker:

Q. Previous to your leaving the Geological Survey had you any conversation with Dr. Selwyn upon this map? Did he indicate to you that it was his intention to suppress it?—No, he never did. I might say Sir William Logan took exception to the views which I put forward in 1870 and 1871, and showed great displeasure thereat, with regard to the geological map of the Eastern Townships, Dr. Selwyn espoused strongly the views of Sir William, as opposed to mine. After fully examining, however, at my request, the evidence which I had laid before Sir William, as well as himself, he came to the conclusion that I was right and that Sir William was wrong. Sir William meanwhile examined this question and, as I am informed by Dr. Selwyn, recommended the suppression of the map.

By Mr. Wood:

Q. With regard to this map that has been referred to, and which Dr. Selwyn published, if I understand you rightly, as a topographical map, is it correct?—It is an excellent topographical map of the region in question.

Q. Was there anything improper in Dr. Selwyn taking the work of Sir William Logan, as he found it to be correct, and giving it to the public in that shape?—I will simply say that he published it as "the work of the Geological Corps, Alfred R. C. Selwyn, Director," and it was not correct to say that it was the work of the Geological Survey, except as the work of the map-maker.

Q. It was not then Sir William Logan's map?—Mr. Barlow was the chief map-maker for the Survey, and he was at work on it for ten years.

Q. It would not be right then to publish it as Sir William Logan's map?—Except that Sir William Logan, in one or two places, might have made some little suggestions, as he had a keen eye to topography, it was to all intents and purposes a Crown Lands survey, and prepared by Mr. Barlow, under Sir William Logan.

Q. What would have been proper to put on it?—"As a map of the Townships, compiled for the use of the Survey, by Mr. Robert Barlow, from such and such sources, and with geological lines by the Geological Survey, Sir William Logan, Director," because his position as Director could not be ignored. And then Dr. Selwyn might, if he wished, have put at the foot of the map, "Alfred R. C. Selwyn, Director, from such and such a date."

L. R ORD, Esq., twenty-seven years of age, was next called examined.

By the Chairman:

Q. Have you been connected with the Geological and Natural History Survey of Canada?—I have been connected with the Geological Survey of Canada for five years, from 1876 to 1881.

Q What position did you occupy when you were first connected with the Survey?—Surveyor and explorer. There was no stated position; I was employed temporarily at first, and then I was placed on the permanent staff, as surveyor and explorer.

Q. What were your previous experience and attainments to qualify you for service on the Geological Survey? I refer to your academic training, &c.?—I had no academic training, but an ordinary school education. I was employed by Dr. Selwyn, in 1873, on his expedition to the North-West, and also on a special survey of the North-West Territories, in 1874 and 1875. In 1876 and 1877 I was Mr. Vennor's assistant in the phosphate regions of Ottawa and Pontiac Counties; in 1878 I was sent out as Mr. Richardson's assistant in the Shickshock region, and in 1879-80 I was given a district of my own to explore, in the Counties of Argenteuil and Berthier, north of the St. Lawrence.

Q. What force of assistants had you when you had a district of your own?—In 1880, I had Mr. McConnell. That was the last work I did for the Survey.

Q. Did you prepare a report of the work you did?—Yes; in both years.

Q. Does it appear in the published reports?—No; only a notice of it by Dr. Selwyn, in his summaries.

Q Was your work apparently satisfactory to the Director of the Survey?—I think so; he never gave me any reason to suppose that it was otherwise.

Q. On what account did you sever your connection with the Survey?—Well, I had applied for an increase of pay, and it was general disagreement with Dr. Selwyn. I thought there was no chance of getting on, and that as he had given me charge of a district, I thought I should get an increase of salary as well. It was rather a question of salary; I applied to the Department, and received an answer that everything was left to Dr. Selwyn, and I thought that as long as Dr. Selwyn was Director there was no chance for me, and I left, the first opportunity I got.

Q. What occupation are you following at present?—That of Dominion Land Surveyor.

Q. Have you been connected with the Government since then?—Yes; I have been employed by the Department of Dominion Lands for the last two years.

Q. How does your remuneration, in your present position, compare with that, while you were on the staff of the Geological Survey?—Very much better. Of course, when I left the Survey, it was not so much the question of remuneration at that time, as the prospect. There seemed to be no prospect of any advance in any way.

Q. Can you give to the Committee any views or suggestions as to defects in the administration of the Geological Survey, and, if so, in what would you suggest that it might be improved?—It is rather a lack of system than a system, as far as I have seen. A gentleman of the Survey has his particular field to work out, and although

the Director invariably interferes and dictates to him, saying that he should work out that field in a particular way, he does not go any further than that. Dr. Selwyn is not sufficiently conversant with the way of working up the country, to give directions that are worth being listened to by the members of the Survey.

Q. Do you know anything about the suppression of reports of the members of the staff of the Survey?—I have heard frequent complaints from nearly all the members, particularly those on the part of Mr. Webster. I have heard him complain frequently that the Director quoted such and such facts from him, and published them himself. This report for 1880 81-82 is an instance of that.

HUGH FLETCHER, Esq., thirty-five years of age, was also called and examined.

By the Chairman:

Q. Are you connected with the Geological and Natural History Survey of Canada?—I have been connected with the Geological Survey of Canada since the fall of 1872, and have been continuously connected with it since that time.

Q. What were your previous qualifications for the work of the Survey?—I am a graduate in Arts, a B. A. of Toronto University, and before joining the Survey I had lived for some years in the copper mining region of Lake Huron, and was pretty well acquainted with the mining and smelting of copper. After I graduated I spent some months in the office of a civil engineer, studying draughting, and then paid a visit to the Lake Superior silver region in a professional capacity, to report on some properties there. I was then for about a year connected with some gold mines at Tangier, N.S., of which my father was the manager. I joined the Survey about the end of August, or the beginning of September, 1872, as assistant to Mr. Robb, who was engaged to survey the Sydney (Cape Breton) coal fields. Mr. Robb resigned in 1875, and I was appointed his successor to carry on the work in Cape Breton. Since then I have been engaged in Cape Breton and Eastern Nova Scotia (in Guysboro' County principally). We began in the eastern part of Nova Scotia, and continued westward.

Q. Have you gone there each season?—Every season since 1872.

Q. What assistance have you had?—The first year I was only allowed $200 for field expenses, and I had only one assistant; now I am allowed anything up to $1,600 and have five or six assistants.

Q. How long are you in the field each season?—From five to seven months. We generally get away about May and come back in November or December; it depends on the season.

Q. What is the nature of your work? Is it following up surface indications or examining the general appearance in the stratification of the country, or is it explorations of actual working operations?—It includes all these. In Cape Breton we have one of the most important coal mining sections in the Dominion, and in working up that we had to report on the working mines, the outcrop of all the seams, the area of the coal-bearing rocks, &c. We have to report on the condition, prospect and working of the collieries; that was Mr. Robb's work principally, before I took charge. Then it means making a general map, to show by geological coloring the extent of the various groups of rocks containing minerals of economic importance. In order to accomplish that object in Cape Breton, it was necessary for us to make the maps of the country, because there were no maps of the country, not even county maps in any county of Cape Breton at the time we went there, and therefore a great deal of our time had necessarily to be spent in this topographical work, because, as every geologist knows, correct topography is at the basis of actual geology, and therefore of scientific practical mining. Then, in the course of that, all the streams and roads, and lakes and shores, had to be surveyed; in fact, a topographical map of the country had to be made. In the course of these explorations one of the first objects was, of course, to keep a look-out for minerals of economic value. In most cases they were well known before, but in some cases we indicated minerals which have since been worked.

Q. Have you, each season you have been there, prepared a detailed report of your work?—In some cases the work of two seasons was published in one report; that is, one season's work was allowed to run on into the next. In every year I have prepared a summary report, at any rate, and the map, which is the principal part of the work, has been carried continuously forward. The maps, I might say, were always ahead of the reports; in fact, I never write my reports until I have all the information on the maps, and in those cases one has to make maps of the country. There is an Admiralty map of the country, showing the shores and the general shape of the country, and then there is the map of Messrs. Gisborne and Hill, showing the shores and some of the roads and lakes, just such information as could be made out from the Crown Lands and other general sources of information.

By Mr. Cameron:

Q. Do you consider the maps of eastern Nova Scotia and Cape Breton important?—I consider them of more importance than the reports. I think almost everything of value could be put on the maps, and accompanied by a short report would be all that was necessary for a geological description of the country, and it is what miners really look at when they come into the country.

Q. Were maps of the island of Cape Breton published up to this time?—There was the map of Mr. Mackenzie, of Sydney, published in 1883, from information supplied to a great extent by the Geological Survey.

Q. Is there a geological map of the Island?—No; not published.

Q. Nor of any county in the Island?—Yes; of Cape Breton County, finished in 1877.

Q. What are the most important minerals of economic value on the Island?—Coal, iron, gypsum, limestone, copper, lead in small quantities, and silver. There is also gold, but it has not been worked to any great extent, although in several places there is good promise of the gold mines proving of importance. The coal mines were pretty fully reported on in the report for 1872-3 and 1874-5 by Mr. Robb.

Q. Did you notice any coal in Victoria County?—There is coal at New Campbellton, on the Great Bras D'Or.

Q. And in Richmond County also?—There is a coal field of some size bordering on the Strait of Canso, at the eastern end, including the Middle River and Cariboo Cove mines.

Q. Are there not also extensive coal fields in Inverness County?—Yes; large exposures of coal occur at Chimney Corner and from Broad Cove Marsh to the Broad Cove Mines, at Mabou and Port Hood.

Q. Any further south?—Yes; in a small basin on the River Inhabitants, near Glendale.

Q. Did you see any gold along the Middle River?—No; but I have seen gold that came from there. I never washed it out myself, because I had perfect confidence in the statement of Mr. John Campbell, one of the first explorers, who also says that it is found in the North-east East Margaree River.

Q. I suppose that gold must be washed from the mountains?—It is washed from the mountains into the adjoining brooks.

Q. There is a large extent of country there not explored?—Yes; we surveyed all the brooks in the neighbourhood, and to a certain extent indicated the rocks in which this gold may be sought for.

Q. Are not the coal fields of Inverness County very extensive?—They are not as extensive as those of Cape Breton County, which are most important; but they are very extensive, and would be very extensively worked were it not that there are no shipping harbours on that shore.

Q. There is also plaster there, is there not?—Yes; and plaster is also found in other parts of Cape Breton. One of the prominent features of the scenery of Bras D'Or Lake is its white cliffs of plaster.

Q. Did you ever notice the plaster deposits at Mabou?—Yes; they were largely worked at one time, and if there had been a good harbour they would have been worked to this day. There is an enormous deposit of plaster there.

Q. Is there not marble in Inverness County also?—Yes; in the west bay of Bras D'Or Lake. There is marble also, of the same geological formation, at a place called Turk, and also on George's River and at French Vale and Eskasoni. The limestones are largely exported from the Strait of Canso to Prince Edward Island and elsewhere. The gypsum was also largely exported at one time from the Strait of Canso, and is now largely exported from the neighbourhood of Baddeck and the Strait of Canso.

Q. Is the Island well timbered?—It was, I believe; but I think nearly all the pine and hemlock have been cut out. There is a good deal of hardwood, and in some places hemlock is still found.

Q. Would you consider, then, that the publication of a geological map of the Island was important? If it had not been considered important I do not think the work would have been undertaken.

Q. I may here quote a letter that Dr. Selwyn placed in the hands of the Minister of Justice last year, which shows the importance of a geological map of the Island, and which I think ought to be published. Dr. Selwyn says:—"The map of Cape Breton County has been published, and accompanies the reports for 1876-77 and 1877-78. Those of Richmond, Inverness and Victoria Counties are ready for the engraver. Apart from geology, they are valuable maps (scale one inch to a mile) for all purposes for which maps are required, and I think they ought to be engraved on copper plates, and thus be permanently available, as no better or more accurate maps will probably be made of Cape Breton during this century. The lithographic work done by the Burland Company is not satisfactory, and there is no certainty when it will be completed. If the map is engraved, as it ought to be, it must be done either in the United States or in England. Next year—*i. e.*, after the 1st of July, the necessarry funds will be available. If put in hand at once, a good many months would be required before it could be ready to print. I should like to have it ready to accompany Mr. Fletcher's final report on the geology of Cape Breton, now being prepared. The MS. of the map can be inspected at the office by any one who wishes to do so." As people complained that the reports and the maps were not published, I have taken some active part in securing their publication. The other day I wrote to the Burland Company, and they referred to the map in these terms:—

"MONTREAL, March 20th, 1884.

"HUGH CAMERON, Esq., M.P., Ottawa.

"DEAR SIR,—In reply to your favour of the 19th, we have in hand a large geological map of Cape Breton, which, I think, includes the Counties you mention. It has been in our hands (or a part of it), for some months, and we are now pushing it with all possible despatch. It is a very fine map, and is being nicely done, which necessarily takes time.

"Yours truly,
"G. B. BURLAND,
"*Manager.*"

These are evidences of the importance of those maps, which I desire to have made public. Now, when were those maps ready for publication?—The work was done from the south towards the north, in 1878 and 1879. Maps were ready to accompany my report for 1879-80, which report had been kept over a year at the request of the Director, until a few additional particulars could be added to complete the map, as, in his opinion, as well as my own, the report was of comparatively little value without the map. When I was speaking of the mineral resources of Cape Breton, I should also have mentioned the copper deposits. There is one mine in Cape Breton County, the Coxheath mine, where American capitalists have spent upwards of $200,000, I think, in developing it. Other deposits have been worked at Gabarus and at Cheticamp, Inverness County. There is also a little copper at Whycocomagh. With respect to iron, valuable deposits of red hematite have been found at East Bay, Big Pond, Boisdale, Whycocomagh and Middle River.

Q. Have you any idea when the map was sent to the lithographer?—Yes; it was sent in April last. I should state that the whole of the map was not ready in 1879; it was only the map including Richmond and the southern part of Inverness and Victoria, which should have gone in the report of 1879-80. It was then kept back—I cannot understand why—and the report might have been issued in the form in which it now appears in the volume of the year previous, that for 1878-79, but at that time the Director had a long report of Dr. Dawson's, and this report of Cape Breton being a long one, he thought it would be as well to keep it over; at the same time he had also requested Dr. Bell and Mr. Ells to cut down their reports and make them as short as possible. In the subsequent year, as I have before stated, this report on Cape Breton was published, but without the maps, no reason being given for withholding the maps, and then no more was said of them until the remainder of Cape Breton had been surveyed and all the maps were ready for publication. Then this, to which Dr. Cameron has just referred, took place, and about a year ago, on Dr. Cameron bringing it before the attention of the House, the maps were given to Mr. Burland, first in several large sheets. These large sheets were prepared by Mr. Fairbault and myself for the lithographer, and sent down to Montreal. I have no knowledge of the subsequent correspondence between the Director and Mr. Burland, except that Dr. Selwyn afterwards told me to get them made in sheets 24 inches by 18 inches. Then a third change was made, this time into little sheet 18 by 12 inches. What influence that may have had on the time necessary to prepare them, Mr. Burland could tell better than I can.

By Mr. Baker:

Q. What effect would that have upon the delay which has been caused in the production of these maps? How much would these frequent changes throw the lithographer back?—I do not know; but one thing is certain, and that is, that this delay can only apply to the work done since 1879; the maps relating to the work done in 1878-79 were ready for publication in the report for 1879-80.

Q. I have heard the frequent complaints which have been made about these maps not being completed as quickly as they should be. Now, it appears that the reason was these numerous alterations?—I do not know how they would affect the delay.

Q. But what is your opinion? Suppose you were the lithographer?—I think, if I could afford to do it, I would throw up the job.

By Mr. Cameron:

Q. These changes were not made at your suggestion?—Certainly not; my idea would have been to carry out the original plan.

Q. Do you consider these changes any improvement?—I consider them the reverse of an improvement. It would increase the expense to have them published in little sheets.

Q. Several complaints were sent to me from more than one county in Cape Breton, and I was anxious to know where the fault lay, and from what you say I would infer that it was not your fault, as they were got ready some time ago?—My connection with the survey for Cape Breton finished two years ago, and, of course, the longer the publication of the map is delayed, the less I am fitted to supervise the work, a great deal depending on the immediate filling up of the maps.

By Mr. Baker:

Q. What is the ordinary time within which a report should be sent in to the Department, after the completion of the work?—I think that wherever practicable the reports should be sent in without fail during the following winter. Instances of the folly of delaying reports have often occurred in the Department; one man after another has left the Survey, leaving his maps and field notes in the crudest condition.

Q. In fact, I suppose you have no sooner got throught with work of that nature, with your report in that crude state, than you will be sent off to another section of country?—Yes; though not in my case.

Q. Then I am to infer that if you were to carry on the work continuously in one section of the country you could better follow out your researches?—Most decidedly.

Every year that a man of ordinary intelligence spends in the same section makes him better fitted to work in that district.

Q. And the first year of a survey of that nature may be considered initiatory?—Yes.

By Mr. Cameron:

Q. How long is it since any of your reports were published?—My last published report appeared in the volume for 1879-80, and related to the work of 1878-79.

By Mr. Baker:

Q. Is it customary for the officers in charge of a particular section of the Survey to keep duplicates of the reports sent in to the office?—I do not know whether it is customary or not, but it is not often done. I begin to write it out roughly, and in re-writing it, where there are pages that do not need to be re-written, I let them go into the report. I do not think that in my case I have re-written any report.

Q. Suppose that in the transmission of these valuable reports they should miscarry, would you have duplicates of them?—If I were to lose the last report, which has now been in the hands of the Director for some time, I would have to re-write it.

Q. But you have the material?—Yes; the field notes.

Q. Do you not consider that it would be wiser to keep duplicates of these reports?—Most certainly; but I do not think it is quite fair to ask an officer to re-write his report with his own hand; he has more important work to do.

Q. Is it a matter of frequent occurrence that the matter appertaining to a section of the Geological Survey is sent in to the Director in a crude form, by the officers for him to put in shape?—The Director should do so, if they were not able to write them themselves. In Sir William Logan's time, some of his best men, like Mr. Richardson and Mr. Lowe, who were competent explorers and geologists, but were not sufficiently educated to write their own reports, had their reports written for them by Sir William. Mr. Richardson used to complain, when Dr. Selwyn succeeded to the directorate, that he could not get his reports out, because Dr. Selwyn would not take the same pains as Sir William did.

Q. But still the precedent has been established in Sir William Logan's time, that these reports were sent in for him to revise and to see that they were published in proper shape?—That is one of the most important functions of the Director of the Survey, and now, with so much money to expend, I should think it would be the chief work.

Q. The editing, so to speak, of these reports, has been done in Sir William Logan's time, and consequently it is not a new departure for Dr. Selwyn to pursue the same course?—No; if he does pursue it, but I do not think he does. The material was given by Mr. Richardson into Sir William Logan's hands, who "licked it into shape," as he himself expressed it, correcting any inaccuracies of grammar and spelling, and perhaps of statement, which might occur.

Q. Do you consider that when you send in a report to the Director he should alter it in any shape or form beyond that of correcting grammatical or spelling errors, &c.?—No statements should be altered. I think a man who works in a district, if he is competent to work there, is more competent to judge of the correctness of his work than the Director, who has not been there, however efficient that Director may be. For instance, a report of Dr. Hunt's is published in the proceedings of the Pennsylvania Geological Survey, and Prof. Leslie, in a note, states that he does not agree with the conclusions arrived at by Dr. Hunt, still he publishes the report in the form in which it is given by Dr. Hunt. He says there are differences of opinion; these are not my opinions, but they are Dr. Hunt's.

Q. You would be equally satisfied, with regard to your report, if that course were pursued in your case? You would not like to see your opinions eliminated from the report, but would rather have your report sent in as it was, and allow the Director to make any additions to it he pleased? That would be the correct thing to do?—Yes; I think so. In some points, a man of great ability and knowledge, perhaps superior knowledge of them to the man who has been working in a certain district,

might see at once that you were wrong, and might correct them, but I do not think he should override the opinions expressed or the deductions arrived at by the subordinates.

Q. Then, it is not so much a matter of what is done as the way in which it is done—I mean, as regards these alterations?—None whatever; that is the point I wish to make.

Q. It is really a matter of fact?—I do not think that reports should relate very much to matters of theory.

By Mr. Dawson:

Q. They have run too much in theory hitherto?—Yes; I think so.

Q. With regard to Mr. Richardson, is it not just possible that a man, although he is not very much of a literary man, might he not, at the same time, be a thorough and good geologist?—Mr. Richardson was such; as Sir William Logan states, in his report on the geology of Canada, in 1863, he required assistance to put his observations into proper shape.

By the Chairman:

Q. I notice in the reports a few years ago, some reference to the intention of the Director to have a catalogue published of the Library and Museum. Will you state if any such catalogue has been published?—None; year after year the same statement is made that the catalogue is being prepared, of the Library in particular, and the latest reference to it, I think, is in the last report. On page 11 of this report the Director states: In September, Mr. A. B. Perry, graduate of Kingston Military College, was temporarily appointed for three months as acting Librarian, and during that time he arranged, labelled and numbered nearly all the books in the Library, and made very considerable progress in the preparation of the catalogue." A statement, almost precisely the same, is contained in the report of 1873-74, page 5, and ten years elapse and still no catalogue. The same remark applies to the catalogue of the fossils and minerals of the Museum, which is a much more important matter. I think a catalogue has been begun, but I do not know how far it is advanced.

Q. It has not been published?—No; there are a great many complaints; the Library contains 4,500 volumes, and it is very difficult, for even the men in the office, to tell what books are there.

By Mr Dawson:

Q. And do you take the books out of the Library?—Yes; we can take them out, by giving a receipt for them.

By Mr. Baker:

Q. Members of the staff?—Yes.

Q. But not outsiders?—I think not.

By the Chairman:

Q. I notice a somewhat similar promise, made as long ago as 1870-71, that it was the intention to report upon the mineral statistics of the country. Has that promise been kept?—No; no mineral statistics have been prepared since 1872-73. I assisted Mr. Robb in tabulating them. Of course, in the course of these reports, there are statistics to be found with reference to the industries in certain regions to which the report of the officers refer; for instance, about the coal mines of Cape Breton, in 1874-75.

Q. I would like to ask you a few questions with reference to the administration of the Department, and first, in reference to the vacillation in managment or direction; there has been some complaint on that score, that is, of contradictory instructions given, not only to the same man, but to different persons, in reference the same field of work?—When we go out to the field every year, we receive from the Accountant a copy of instructions, printed off by a lithogram—I suppose the same copy of general instructions would be given to every man—but they do not carry much weight, because, I think, they are seldom followed. Instructions this year may differ from those next year, perhaps.

Q. But do they differ in the spirit of being contradictory?—I can give you an instance of that. In Sir William Logan's time, the members of the staff were

instructed to ink their field notes as soon as possible. I do not think it is necessary, but such an instruction was issued, by the present Director, to the members of the staff. It was pointed out to him, however, that different instructions had been issued on the Canadian Pacific Railway, to the effect that the field notes should not be touched, as it might lead to mistakes. Accordingly, Dr. Selwyn issued an order directly the opposite to the one he had previously issued.

Q. I do not think you understand me. I mean, with regard to the nomenclature, for instance?—I might state in that connection, that the British Association are to be brought out this year, to be told that Sir William Logan's Laurentian rocks are not Laurentian at all, but are Huronian, (Report for 1877-8, page 14A) and here in the report of 1880-81-82, there is a new classification given by Dr. Selwyn which differs from everything else which has been published in regard to the geologial formations. It is headed "Stratigraphical Nomenclature," and is found on page 48 of this report. It differs from every classification known; it differs from that of the Bologne Congress, at which Dr. Hunt was present, and it differs from the well-known one of the British Survey, which had always been followed by Sir William Logan. But there is a far more important discrepancy; Dr. Selwyn also gives a new scheme of colors, which, as everybody knows who has looked at the report, differs even from the colors on the maps of the very same report, and also from those used by Sir William Logan, and the British Survey, and which had been followed up until this scheme was inaugurated. Now, this would lead to great confusion. As an instance that it does not agree with the classification in the reports, I may say that on the chart of colors the Quebec group is classified as Upper Cambrian, while in one of the reports (p. 16 DD.) it is described as Cambro-Silurian.

By Mr. Dawson:

Q. I was told the other day that in the Department there were immense piles of the former reports of the Survey which have never been used? Is that the case?—There is a whole room full of these reports which have never been distributed. They are being distributed from day to day.

Q. But there are also reports there, are there not?—I do not think it would be judicious to distribute every report that the Survey owned in one year.

By Mr. Baker:

Q. You stated just now that previous to going into the field you went to the Accountant and received instructions written by a lithogram, but those instructions were not always followed out; in fact, more frequently not. I want to ask you if you consider that the correct thing? Do you not think that the instructions of a superior officer should be carried out?—Yes; as far as possible, but I know that in a great many cases no care is taken to have them carried out. He, himself, does not care to have them carried out; they are too unimportant and contradictory.

Q. That is an assumption. If you receive instructions from the head of the Department to do certain things, I think they should be carried out, except for certain specific reasons?—So do I; but you cannot depend upon the subordinates carrying them out on account of laxity of discipline. It is the duty of the Director to see that they are carried out.

By Mr. Dawson:

Q. But if they have instructions that are not at all applicable to the duty they have to perform, they have to rely upon their own judgment?—Yes, very freely.

By the Chairman:

Q. Supposing that you were going to a certain field, and that you were attempting to elucidate a certain geological problem, does he give you written instructions?—No; every gentleman is given his field, and is told, verbally, to do the best he can with it.

By Mr. Baker:

Q. The instructions you referred to as having been received from the Accountant previous to going into the field, were devoted to Departmental matters, were they not?—Yes; how to keep our note books, &c.

Q. But do you receive any specific instructions as to the work upon which you are going, signed by the Director ?—No.

Q. Do you not receive any instructions from the Director himself ?—No.

Q. Do you receive them signed by the Accountant ?—No; these are signed by the Director, and relate to departmental matters.

Q. But nothing about scientific matters ?—No.

Q. Do you mean to say that you never receive any general instructions as to the nature of the work you are going upon, from the Director ?—Only verbal instructions.

Q. Did you ever receive any instructions like this: "To leave Ottawa on such and such a date and investigate a certain locality." Do you receive any instructions of that nature ?—No.

Q. So that you start out to paddle your own canoe, as it were ?—Yes.

By the Chairman:

Q. You are practically a Director yourself the moment you leave Ottawa ?—Yes; the Director should have an intelligent understanding as to what sort of information you were to get in the field.

By Mr. Baker:

Q. Am I to infer that the absence of these instructions is any detriment to the work ? In my opinion it is a detriment to the work. I think that most of the men feel the want of some instructions. It is not a case of having too many instructions and not obeying them, but of not having any to obey.

Q. Then, if you had the instructions and were to disobey them, the onus would rest on you ?—Yes.

Q. At present the onus cannot be placed anywhere ?—No.

"GELOGICAL AND NATURAL HISTORY SURVEY,
"OTTAWA, 20th March 1881.

"DEAR SIR,—A question having been put to me while giving evidence before the Geological Survey Committee, as to whether the Survey had reported against the probability of the occurrence of coal in the Rocky Mountains west of Calgary, where the Cascade River anthracite basin has lately been discovered, I replied that I believed no such statement or report had been made.

"The district particularly referred to, was actually examined for the first time last autumn, and no report on it has yet been printed. Any allusion to the occurence or otherwise, of coal, must therefore, have been incidental merely. I have, however, searched the published reports of the Survey and can find no mention whatever of the district in question, except one of a general character, in my preliminary report on the Bow and Belly Rivers districts, published in May, 1882, where the following observation occurs:—

"'The most interesting feature of these explorations was the discovery that in the region of the Crows' Nest Pass, wide valleys based on cretaceous rocks occur west of the first range, formed of polæogoic limestones, and that, in these cretaceous rocks, an important intercalation of volcanic material appears. *It is possible that in some of these now isolated troughs of cretaceous rocks coal beds may yet be found, in the heart of the range.* The existence of a seam was indeed reported about twenty miles west of the summit of the Crows' Nest Pass, but I was unable to read the locality.' (p. 2).

The words italicised in the above quotation have since been found out by the discovery on Cascade River and by other discoveries of a similiar kind in the southern part of the range.

"I have the honour to be, Sir, your obedient servant,
"GEORGE M. DAWSON.

"ROBERT N. HALL, Esq., M.P.,
"Chairman Select Committee on Geological Surveys."

HOUSE OF COMMONS, OTTAWA, 26th March, 1884.

The select Committee on Geological Surveys met this morning, Mr. HALL in the Chair. FRANCIS BENNETTS, Esq, Mining Engineer, of Ascot, P. Q. was called and examined

By the Chairman:

Q. How long have you been connected with the mining industries of Canada? —About thirty years altogether.

Q. Before coming to Canada had you any experience in mines in Great Britain, and if so, what?—I have gone through every department of mining, and had about eleven years of practical experience in Great Britain.

Q. Will you state briefly your experience in this country? I believe you have had some experience in the Lake Superior region?—I have examined some of the mines there—the Bruce and Silver Islet Mines.

Q. What has been your principal occupation here in Canada?—I have been twenty years in the Ascot Mines, in the Eastern Townships. I am the representative in this country, of the Canadian Copper and Sulphur Company, (Limited), whose headquarters are in Glasgow, but their affairs are managed by John Taylor & Sons, the eminent mining agents, of Queen street, London.

Q. Will you state to the Committee, briefly, what actual mining operations are now being conducted in the Eastern Townships?—There is the Canadian Copper and Sulphur Company (Limited), the Orford Copper and Sulphur Company, the Union Company and Messrs. G. H. Nicholls & Co.

Q. These operations are all caried on very near each other, are they not?—Yes, within a radius of ten miles, in the neighborhood of Ascot.

Q. How many men are employed in these mining industries there?—About 500 hands, boys and men.

Q. What population would that represent?—The population immediately supported by mining there, is about 2,000.

Q. What is the output of the mines there?—From 4,500 to 5,000 tons. It has increased from a few hundred tons to about 5,000 tons a month.

Q. What depth have you reached in your own mine?—The Orford mine is below ours, on the continuation of the same vein. They are down about 1,000 feet.

Q. For the last ten or fifteen years, are you aware that that section of country has ever been visited by any one from the Geological Survey of Canada?—I have no knowledge of any of them being there. I have looked over the reports of the Survey and see no reference to these mines having been examined by the Geological Survey. There is, in the last volume of reports for 1880-81-82, two pages devoted to the copper mines of the Province of Quebec, but they contain no reference whatever to the three principal mines to which I have referred.

Q. How much cash do you think is expended in connection with those mines in the Ascot district?—In the mines that I am immediately connected with and in the vicinity, I should think there was an expenditure of about $250,000 a year for all purposes, or from $20,000 to $25,000 a month.

Q. Please give to the Committee some general idea as to the value and extent of the mineral deposits in the Eastern Townships?—They are simply immense. They are connected with the lower grade ores. The deposits include iron and copper, and there is also what I call sulphur pyrites.

Q. The iron deposits are of vast extent, are they not?—Yes.

Q. And of great richness?—Yes; a very high per cent. of iron ore.

Q. These immense iron deposits have not, thus far, been practically utilized, owing to the difficulty of smelting, and to the expense of getting fuel, but there is no question as to their richness and ultimate value?—No; I should think not.

Q. As to the copper interests, is it equally true that there is a vast amount of copper ore?—Yes; the copper ore is associated with sulphur. What we use is the 3 to 3½ per cent. of copper, but it also contains a large amount of sulphur, from 35 to 42 per cent.

Q. The low percentage of copper has made it difficult to realize a benefit, so far as devoted to copper alone?—Yes; the sulphur was wasted for a good many years and is still wasted. The great value of the sulphur has only been appreciated since the value of the sulphur deposit in the Tarsis mines of Spain has been established. It is admitted now, in the United States, that the sulphuric acid manufactured from it is as good as that produced from any sulphur mine.

Q. What use is now being made of the sulphur in these mines, and how is it being utilized?—The sulphur of the Orford mine and of the Messrs. Nicholls is sent immediately to New York, where it is utilized in making sulphuric acid.

Q. Why?—Because there is greater encouragement there for its manufacture. It is taken from the mine in its raw state and taken to the United States to be utilized there in the manufacture of sulphuric acid.

Q. Has there been an enormous expenditure of money in Ascot that is now perfectly idle on account of these ores being sent out in their raw state?—Yes; the works of the Orford company are now lying idle.

Q. If the manufacture of sulphuric acid and of agricultural fertilizers were encouraged in this country, would it have the effect of keeping all that manufacture in this country?—Yes.

By Mr. Ferguson:

Q. What proportion of that ore is refused when they get it in New York?—The constituent parts are sulphur, copper and iron. They take out about 3 per cent. of copper and about 40 to 42 per cent. of sulphur, and the balance is iron, which may or may not be utilized; that is, you get 3 per cent. of copper, 35 to 42 per cent. of sulphur, 30 per cent. of iron and the rest is earthy matter, fully 20 per cent. of waste.

Q. Is that iron of any great value?—No; it is comparative waste as well.

Q. Then they pay freight on this waste in order to get it there to make sulphuric acid?—Yes.

By Mr. Baker:

Q. Do you mean to say that there is 20 per cent. of earthy matter?—Silica is included in this 20 per cent. which is also included as waste.

Q. And freight is paid on that as well?—Yes.

Q Is not some of this so-called waste of merchantable value?—Twenty per cent. of it is lost altogether, but 30 per cent. of it is of merchantable value, sometimes.

By the Chairman:

Q. When the sulphuric acid is manufactured we get it back into the country and pay freight and duty on it, I suppose?—They pay freight and import duty on it into the United States, and we pay freight and duty on it to get it back.

Q. What is the value, do you think, of these Orford smelting works that are now standing idle?—From $100,000 to $150,000.

Q. As a practical mining man, will you state to the Committee what value do you think the country is getting, if any, from the work of the Geological Survey of Canada, in so far as applied to mines?—I am not aware that it is of any value whatever.

Q. Do mining men, like yourself, attribute any value or importance to it?—No; we scarcely know there is such a thing, from a mineralogical and metallurgical point of view.

Q. In what way do you think the Geological Survey might be of practical value to the mining industries of the country?—It would be impossible, of course, to keep the public fully informed upon it, but they should know whether we have any mines or not.

Q. Would not mineral statistics be of great importance?—Yes; mineral statistics and maps of the mines, and general information as to the natural laws regulating and governing deposits, which is the most important feature of it. The veins in traversing the earth meet cross veins; when they meet cross veins the great point is to know what is the effect, because, if I go and expend money in an opposite direction from where I should find the vein, there is so much lost. In these mines where they

meet cross veins the effect is to produce what is known in coal mines as a downthrow or an upthrow, and in a copper mine as heaves, a right or left heave. If I work on horizontally—that is, continue my drift on the level, as usual—if it is a downthrow, I would, as a consequence, be above it, and if an upthrow, below it. In the same way, if, on meeting a cross vein of copper, I kept straight ahead, if it is a right heave, I would, of course, be to the left of it, and if a left heave, to the right of it, thus failing to meet with the vein at all. As an instance in the Capelton mine, in one of the drifts, at the point where the vein meets the cross course, there is a left-hand heave of about 54 feet and, of course, if we had gone straight on, or to the right instead of the left, we should have been so much out, and would have probably imagined that the vein had disappeared.

By Mr. Baker;

Q. Do your remarks apply to the world generally?—Yes; there is a general rule even for the irregularity of veins. In districts they are similar and generally perhaps the world over Veins are also subject to dykes and slides and other important variations. A "horse" is a split in the vein occasioned by the intrusion of rock, The inclination of the vein and the angle at which they meet the cross-veins has a great deal to do with the throw or heave. The most instructive book I ever read on the subject was that of William Jory Henwood, in the Geology of Cornwall, Devon, and Summerset, England. These rules will apply to the whole world, of course varying in different districts, but there is a degree of uniformity to them, within the limits of particular districts, and it is important that the records of them should be obtained and preserved, so that wherever capital is isvested in the various districts it may have the advantage of the experience of those who have gone before.

By the Chairman:

Q. Do they keep records of mineral development and maps of mines in Great Britain?—Yes; each mine keeps a record of its production and a map of the mine, and I believe it is imperative now, by law, to keep maps of all the mines, on account of all the late accidents. For instance, when one mine is near the other, and the mines having been abandoned for 40 years, perhaps, and work is again resumed, unless maps are kept to show the extent of the working and their proximity to each other, the water from one might burst into the other and drown the men at work. I have known several such cases.

Q. So that you think, apart from the value of these plans and maps for economical purposes, they ought to be insisted upon for public safety?—Certainly.

Q. You would recommend that these maps should be published and placed somewhere where they would be matters of public record and easily accessible?—Yes; especially as the mines are assuming large proportions.

Q. What is your opinion as to the practical value to this country, of the establishment of sulphuric acid works and agricultural fertilizers in connection with it?—Very valuable. The thing is now under consideration and I believe a company will shortly be formed; in fact there is a company formed for that purpose, and they are looking round for a proper site, and of course they are considering the questions of detail.

Q. You think then, there is a market in this country for sulphuric acid, if its manufacture is encouraged?—Yes; I think there is a large demand for it in this country, besides manufactures from it might be exported.

By Mr. Baker:

Q. What kind of veins are there in Eastern Canada, from your point of view? I have heard the expressions "true fissure vein" "gash vein," and "segregated vein" —The whole answer turns on what you understand by a vein.

Q. It is a space, so to speak, of a certain width, in which the mineral deposit is continuous?—The real contention on these points is, are they parellel with the stratification or do they cut it?—A vein may cut the stratification at a very acute angle or at right angles. As a matter of fact, the veins in the Ascot district do cut the stratification at such a very acute angle that it might escape notice. The length of the vein in the Hartford mine and in the Albert and Crown mines is from

1,800 to 2,000 feet, and it has been traced for about two miles, but the important commercial question is not so much whether they are veins but whether the deposits will pay.

Q. What are the indications of a true fissure vein?—Cutting the stratification, as according to the accepted idea of a vein.

Q. Have you any knowledge, either personally or by hearsay, of the mineral deposits of British Columbia?—No; I have known men who worked out there.

Q. They seem to say that everything is upside down there, and where you should go to the top the ore is on the bottom, and where you should go to the right it is to the left?—If they would closely observe the breaks, they would be able to form some idea.

By Mr. Ferguson:

Q. Do you think there is a market in Canada for sulphuric acid, or could it be shipped abroad?—It could be shipped abroad, probably not in the form of sulphuric acid, but associated with phosphates in the manufacture of superphosphates and other products, into the manufacture of which sulphuric acid enters. The company I represent have some idea of starting the manufacture of sulphuric acid. If they get some encouragement, they would also make superphosphates and other chemical compounds. There is a large demand for it in France, and the Eastern Provinces would use superphosphates too. The retail price of superphosphates in England is £4 a ton. They import not only superphosphates, but they get the Tarsis ores.

Q. They say there is a large quantity of phosphates exported to England?—Yes; for the purpose of making superphosphates.

Q. You say they produce it there for about £4 a ton?—They sell it in the district of Devon at £4 a ton retail, and they give a discount to the farmers for cash payments.

Q. What encouragemant do you think such a Company ought to have or would be necessary to induce them to engage in its manufacture in this country?—I think they should be allowed to bring in their plant and their material to make the plant free of duty.

Q. Would that amount of encouragement conduce to that end?—I think they ought to have a subsidy. There is a rebate on articles manufactured from iron in Canada, when it is exported. We are now in our mine, working copper by smelting and making a 3 per cent. article into a 25 per cent. article, that requiring labor for its production. To do that we incur great expense in material besides the labor. A large part of the material is taxed and our copper has no privilege at all and has to be sold in a free market, if in Great Britain, or to pay import duty if sent to the United Stated. All the capital invested in the mines is foreign capital, either from Great Britain or the United States. If we could get some way of getting a subsidy on our 25 per cent. article in proportion to the manufacture, it would be a great encouragement.

By Mr. Baker:

Q. These mines to which you have refered as putting out 5,000 tons a month, do they pay?—I may mentioned that one mine which is in the hands of a single firm, commenced with the production of from 200 to 300 tons a month and have gone up to 2,000 tons a month.

Q. They would then have, under the most favourable circumstances, a fair return for their money?—They are now working under the most unfavourable circumstances; the copper is a low per cent. ore and we do not use in this country the sulphur, which forms a very large proportion of the product of the mine.

By Mr. Ferguson:

Q. Do you think it is important that our Geological Survey should point out these things to us?—Yes; some of these rudiments might be taught in the public schools, and you could thus train boys to observation, for this work. I have been working in Canada for thirty years, and I have gone by the natural laws, as obtained by me from Henwood's Geology. I have found that the natural laws, allowing for circumstances, are to a great extent the same as in the old country.

Q. So far as you know, has the Geological Survey of this country been of any practical benefit to practical miners in pointing out and directing them where they should go to look for minerals?—No; so far as I know.

Q. And you do not think any mines have been called into existence as a result of the work of the Geolocal Survey?—So far as I know, the discovery of all the mines in this country have been accidental discoveries; for instance, as regards the Harvey Hill mine, a farmer found a peculiar stone after a tree had been uprooted, and he showed it to some friends to ascertain what the stone was, and they said it was copper and some parties took up the mine and worked it. He might have sent it to the Geological Survey, for all I know.

Q So that, as far as you know, it has been of no value in pointing out where mines might exist or where they did exist?—Not so far as I know.

By Mr. Lesage:

Q. Do you know anything of the gold of the Chaudière district?—No.

Q. Do you know whether it is refered to in the reports of the Geological Survey?—I have never read of it there.

HOUSE OF COMMONS, OTTAWA, 27th March, 1884.

The Select Committee on Geological Surveys met this morning, Mr. HALL in the Chair. R. W. HENEKER, Esq., D.C.L., of Sherbrooke, P.Q., was called and examined.

By the Chairman:

Q. You are the Commissioner of the British American Land Company, and succeeded Sir Alexander Galt in that office, I believe?—Yes, I have been their Commissioner for nearly twenty-nine years.

Q. You are also Chancellor of Bishop's College?—Yes.

Q. And President of the Eastern Townships Bank?—Yes.

Q. You have resided for the last twenty-nine years in the Eastern Townships?—Yes.

Q. Were you acquainted with Sir William Logan?—I was very intimately acquainted with him during his lifetime, and had constant communication with him.

Q. And have always felt, I suppose, a good deal of interest in geological matters, in so far at least as the commercial interests of the country are concerned, mineral deposits, for instance?—Yes; I have always had a great deal of interest in these matters. I am essentially not a scientific mineralogist or geologist, but I have always felt an interest in any work of practical value to the country.

Q. What were Sir William Logan's own views with reference to the direction of the work of the Geological Survey, in so far as it regarded the mineral resources and the economic minerals of the country as distinguished from its purely scientific functions?—He gave a great deal of attention to those matters, and was always ready to give advice and assistance in every way to those who contemplated expending capital in the development of these mines. I have known him, even at the instance of one or two persons, to go out to mines for the special purpose of giving his advice with reference to their exploration. He always guarded himself carefully as to giving an opinion which might induce the expenditure of money, and as to whether mines would become profitable or not. As well as being a geologist, he was a practical miner, having been engaged in mining works in South Wales, so that his advice was of a very practical character. He gave advice with reference to the Harvey Hill mine and of the Acton deposit, the latter of which he always declared was not a mine in a true sense, but a bed or pocket of copper. He also visited the mines at Capelton when they were first opened, and made several reports on them, as well as those at Roxton and Ham, in the latter of which I was one of the unfortunate ones, having spent $30,000 in attempting to develop the mine there. He always gave to those who sought his advice the advantage of his practical ability as a miner, and his scientific knowledge as a geologist. He also visited the Slate Quarry at Melbourne

and the Lime Works at Dudswell. With reference to the gold discoveries at the Chaudière, I might say the largest nugget of gold was discovered by a old man named Oatey under his charge. It will thus be seen that in addition to all the purely geological work performed by him, he gave special attention to the mineral resources of the country. I do not think we could easily find such a man as Sir William Logan; he was such an enthusiast that he did not hesitate to spend his own money when he could not get assistance from the Government. But the great geological work which he did was the preparation of his geological map of the Eastern Townships; for that purpose he searched the Crown Lands Office for correct maps, and he also came to me as the Commissioner of the British American Land Company, for assistance, as our map was the best practical map until recently. In making these maps one surveyor would do one township, and another another, and, as in many cases the lines would not meet, he would go into the field himself for the purpose of reconciling these discrepancies, being to all appearances, incapable of being over-worked or exhausted. He was an enthusiast and at the same time a man of an essential practical mind; his intercourse with the people who went to visit him was most pleasant, and he always endeavoured to explain, in the most simple manner, anything they wished to know, avoiding technicalities; in fact, he was altogether a most remarkable man.

Q. Was the Survey administered under his direction in such a way that the public could get all the information that had been obtained up to that time with reference to mines and minerals?—Certainly. He was willing to give information upon every possible point, and he was always very careful to guard himself against holding out inducements to people, but would tell them at once what measures to take for the purpose of exploring in a practical and satisfactory way, and give them every information with regard to the economical opening up of these veins.

Q. And there were no mineral discoveries throughout the country which did not receive his personal attention or the attention of members of his staff?—No; he always encouraged people to approach him, receiving them in the most cordial manner. I may also say that he had a very able assistant in Dr. T. Sterry Hunt, who was at that time the mineralogical chemist of the Survey. Dr. Hunt came out and gave lectures at Sherbrooke on the characteristics of the deposits of the Eastern Townships, and was always ready to give assistance and advice. These two gentlemen, Sir William Logan and Dr. Hunt, were, I think almost unparalled in the efficiency of their work.

Q. What was the reputation and standing of the Survey at that time in other countries, and with scientific men in other countries?—It was of the very highest character. Of course, Sir William Logan was not merely a Canadian geologist, but his reputation was world-wide. He was received, when he went to the meetings of the British Association for the Advancement of Science, as the discoverer of the supposed fossils in the Laurentian rocks with the greatest possible honor, and he was also in constant communication with the geologists of the United States and worked in harmony with them.

Q. And the great interest which he took in geological matters also attracted attention to Canada?—Certainly. It was he who pointed out the fact that we were the oldest country in the world, in a geological sense. If anything would have made me a geologist at the time, it would have been my acquaintance with Sir William Logan.

Q. Without any reflections upon the *personnel* of the present staff, what is your impression as to its relative standing and importance in the eyes of other countries? —Of course, I do not want to reflect upon Dr. Selwyn, who I have always supposed was a very able man, and who was brought out here under the best auspices, having been asked to come out here by Sir William Logan, but he had a very difficult task to succeed Sir William. I do not think he stands upon the same level as Sir William Logan, whom I must place upon the same level as Sir Roderick Murchison and men of that sort. However, I expect that Dr. Selwyn is a man of scientific attainments, but for the reasons I have mentioned I should say, that the present staff does not occupy the same position before the world as the old staff did.

Q. The present expenditure in connection with the Geological Survey has reached very large proportions, much exceeding those which were placed at the disposal of Sir William Logan. What is your impression as to the practical results, under the present administration? Do they correspond, in your opinion, with this increased expenditure?—I am scarcely able to answer such a question as that, because the country has so largely increased in its area.

By Mr. Baker:

Q. Has it ever come to your knowledge that any discourtesy has been accorded to anybody by Dr. Selwyn, or that people were not treated in the same way as they had been before by Sir William Logan?—No. Personally, I know very little of Dr. Selwyn. I have supposed that on account of the North-West and the consolidation of the various Provinces into a Dominion must have greatly increased the labors of the Geological Survey, and that naturally the new territories would attract more attention than the older ones.

By Mr. Dawson:

Q. But the Survey does not now stand as high in the estimation of the public as it did in Sir William Logan's time?—No, it does not; but I think that may be attributed to the fact that people are now much more interested in questions of commercial importance and of the development of our material resources, everyone looking for an immediate return for their expenditure. It is also important to a new country to have its general characteristics known, in mapping out our work for the future.

Q. Have you any knowledge of having any direct advantage from the Survey?—What I think we really want is a series of careful statistics. At present we have no statistics at all, and I think that of importance, whether they be of copper or iron, or as regards our quarries, such as slate and lime; anything, in fact, bearing upon the mineral resources of the country should be embodied in statistics for reference, so that not only those who are more immediately connected with them, but the outside public as well, would be kept informed on the mineral resources of the country. I think this might be done at very little cost. Every manager of a mine or quarry should be obliged to report from time to time to the Geological Survey, as to the actual working of the mine, the result of the deposits, and also the output. This information would do an enormous amount of good to the country, as it is very hard to find out, from private sources, any information of this kind.

By Mr. Holton:

Q. Are you familiar with the United States Survey and its method of working?—I know that they employ a great many able men in the collection of their statistics.

Q. I would like to ask you what practical good is at present accomplished by the Geological Survey of Canada?—The question is, from what point of view you take it. If you look upon the Geological Survey from a scientific point of view, and it is always held that that is a very important matter; even in the old countries the importance has only recently been acknowledged, and measures have been taken to map out the country. But apart from this, there is the commercial question, and speaking from that point of view, of course it is very important that we should get information from which a financial result might be obtained. There are two sides to the question: one purely scientific and the other purely commercial.

Q. Our desire is to develop what is called the practical side?—I think there is very little being done in that direction, but scientific discovery also leads to the saving of money. For instance, the question of coal was a very important one in the old Surveys of Canada. Sir William Logan claimed that these deposits were not to be found in the Quebec group and when people made pretended discoveries of coal he always decried them, and was at the same time very much abused for it.

By Mr. Dawson:

Q. Mr. Macfarlane still pretends that coal may be found in the Quebec group?—Yes; but still Sir William strongly opposed that idea, and gave his scientific testimony in support of his view.

By Mr. Wood:

Q. Would there be any difficulty in getting these statistics concerning the workshops of the mines?—There ought to be no difficulty and, from a business point of view, there should be no objection. It is easy to obtain statistics from saw-mills, manufacturers of textile fabrics, and other industries. In the manufacturing cities of the United States the amount of raw material used per annum, as well as the product, is published annually, besides the cost of labour and other details with reference to these manufactures. It seems to me that this is essential to the success, commercially speaking, of a country.

By Mr. Holton:

Q. As a guide and encouragement to capitalists?—Yes.

By Mr. Dawson:

Q. Sometimes it happens that, from a cursory survey, they make a report of the whole country in a few years without examining it very closely, and that, to a very large extent, prevents capital being brought into the country?—No doubt; and that is the danger of expecting too much from a geological report.

Q. Sometimes they speak very disparagingly of the workings of the mines?—We have very valuable mines in the neighbourhood of Sherbroke, and enormous sums of money have been spent in developing them. At Capelton there are four mines being worked, with varied results, a great deal depending upon the management. They have spent enormous sums of money on what is known as Henderson's process.

By Mr. Holton:

Q. What do you think of the establishment of a School of Mines?—I think it would be very valuable. The question is, whether we are a large enough country; they have Schools of Mines in England, Germany, &c.

Q. Our country is only small in one respect, that of population. We have enormous mineral resources?—It is a question of administration, and one for the Government to consider, whether they must rely, for the present, upon other countries for men of this kind, or whether they will supply them themselves, and also, perhaps, feed other countries.

Q. Do you not think great advantages would accrue to this country by the encouragement of scientific studies?—Yes.

Q. And can you think of any more valuable scheme?—There is no question about its being valuable; and every class of our education should be thorough. I am an educationalist myself, being a member of the Council of Public Instruction of the Province of Quebec, and I would, therefore, be in favour of increasing our means of education, but the Universities cannot do it of themselves, as they have not the funds.

Q. But I think the Geological Survey might undertake that department of education?—That is a question of expense.

Q. The question of expense being satisfactorily answered then, it should be done?—Yes. We should have scientific men, who have been properly trained in a metallurgical sense, instead of a practical miner, who merely goes by the rule of thumb.

Q. My own opinion is, that the best men are Canadians?—Although an imported Englishman myself, still I agree with you. If you can get a man in the country who is properly trained for the work, it is better to do so, because I am satisfied that any man coming from abroad has to learn the ways of the country, and must unlearn a great deal.

By the Chairman:

Q. You have spoken about the large expenditure that has been made in experimenting in the smelting of ores in the Eastern Townships, many of which have proved unsuccessful. Is it not as important to have a record kept of all the failures, as well as the successes, as a guide for the future expenditure of capital, and also a warning to people hereafter against a particular process?—I hold that that is a necessary part of the statistics.

By Mr. Wood:

Q. That is the part which I thought the companies would not desire to have published?—I do not see any objection to it; their records show it.

By the Chairman:

Q. You have spoken of a very large expenditure in mining operations in your vicinity. Are you aware that the ore is going out in its raw state?—Almost the whole of it goes out in its crude state

Q. For the purpose of utilizing the sulphur, it is sent to the United States. If there were manufactories here for the working of the ore, it would naturally give employment to a good many men here in the country, would it not?—Yes. At present they are making only pure copper, and the sulphur, which forms the largest part of the ore, is wasted. The ores at Capelton are mostly low-classed ores, while those at Acton are high-classed ores.

By Mr. Wood:

Q. Can you make any other suggestions with regard to the collection of statistics?—The only other suggestion which I would make, besides those I have already made, is that we should get, as soon as possible, general geological and detailed maps of particular sections of the country.

Q. Have you seen any of the maps of the Survey?—I saw a map of the Eastern Townships when it was being prepared, and I have applied to Dawson Bros., in Montreal, to see if it was published. I have occasion to use that map, and being at present in Ottawa, I intend to visit the Museum and get what information I want from these maps for the purpose of sending it to England.

By Mr. Dawson:

Q. Prof. Selwyn has issued a sheet in the report for 1880-81-82, in which he gives colors and names to all the different rocks, and it differs very materially from what we have before been used to, and also from the published maps in other countries. Do you not think that is undadvisable?—I should say that was a mistake. I think we should endeavour to harmonize with other countries in all that bears upon the nomenclature.

Q. Because in other countries they will not know what he is doing?—— It increases the work of the student. I think nothing should be done in that direction except by such bodies as the British Association for the Advancement of Science, and not by private geologists.

ALEXANDER SIMPSON, Esq., Manager of the Ontario Bank at Ottawa, was also called and examined.

By the Chairman:

Q. Have you had occasion to consult the Geological Survey of Canada frequently, in reference to mining properties, and if so, will you state what the practical result of your enquiries has been, and give illustrations, as far as you remember them?—I have had occasion to see Dr. Selwyn four or five times in connection with the different properties in which we have been interested, and about which I have been able to ascertain as much information as possible. Of course, I know nothing of geological matters, but I have generally found Dr. Selwyn's reports of a very meagre description. He seems to have no maps that can tell very plainly what should be known, and he has scarcely any information with regard to the workings of the mines. I had occasion, a short time ago, to as ask him, in regard to probably one of the best known iron mines in this district, but he told me he had never heard of the mine and knew nothing about it. I asked him to go out to the mine with me, which he did, but he was considerably prejudiced against it on account of the money which was spent in the machinery, and seemed, from the very first, to damn the property. We have had other reports from practical men in England, but of course the mine has not been developed to any great extent, and it is a matter of opinion.

Q. Previous to that, had he, or any of his staff, ever inspected the mine?—The mine is only seven or eight miles from Ottawa, and he admitted that he, or any of his staff, had never been there, and he had no report at all worth mentioning in the office in regard to it. However, at my request, he visited the mine, and his report was quite contrary to any report received upon it. I also asked him with regard to a plumbago mine down near Buckingham, and he, or any of his staff, had never been near the mine, and the information he had received was probably by hearsay. The mine was considered a very valuable one, and considerable money was sunk in it.

By Mr. Holton:

Q. When you did this, did Dr. Selwyn think it was his duty to get the information, although not possessed of it at the time?—He was very courteous, and deprecated the fact that he did not have it, and laid it down to not having a staff sufficient to prosecute the work in the manner in which it should be prosecuted, and that he had only one man whom he could send into the field, from British Columbia to Cape Breton. However, I went there for information, and did not get it.

By the Chairman:

Q. And these enquiries were all made in the interest of capitalists?—Not only in the interest of capital in the country, but in the interest of capital that was waiting to be put into it.

Q. Did your failure to obtain the information you desired operate against the interests of which you have been speaking?—I should think it would most strongly operate against the introduction of capital. If we consider that the Geological Survey of Canada does not possess the information, I do not see where we could go for it.

Q. But did it operate in any way in this case?—I do not know, but other parties who talked about trying to raise capital have repeatedly remarked to me that the information they received from the Geological Survey was so meagre that they did not feel at all satisfied, and they had to use reports obtained for them. I also had occasion to see Dr. Selwyn about asbestos deposits in the Eastern Townships. He showed me a map several years old, which, he said, he could not rely on, and he could not give any information. In one of his reports he had about a page and a-half or two pages about the mines of the country, but the information about it was of a very meagre description.

By Mr. Holton:

Q. You spoke about the map as unsatisfactory. Do you know what map?—He said that it was not sufficiently new, and did not show any practical results; it showed the formation of the rocks, but no mineral discoveries.

By the Chairman:

Q. No recent discoveries?—None at all.

By Mr. Holton:

Q. Do you know what map it was?—No; but I know he said it was an old map, and he could not give it as being reliable.

By the Chairman:

Q. But still it was the latest in the Department in relation to that section of country?—Yes. As regards information about mines of practical interest to capitalists or banks, he could give me no information as to the output, or the possible or real value of the property

By Mr Holton:

Q. Have you had occasion to ask Dr. Selwyn or members of his staff for such statistics?—Yes; on several occasions.

Q. And you received but one reply on all occasions?—Yes. In the case of this iron mine, I think it was a great shame that more information has not been obtained by the Geological Survey regarding it, because there is a very large amount of capital sunk in it, and at present a very large company has been formed in England to work it, which I hope will be started in a few weeks, and in all cases they have had to send their own exports to judge of the value of the mine.

Q. I would like you to express your opinion as to the value of mineral statistics, to the public?—I consider that that would be the most valuable work which the Survey could undertake in the interest of the public. If the Survey is merely to show the appearance of rocks, &c., it may be possibly interesting to scientists, but certainly not to the general public.

Q. You think, then, it should have a practical side as well as a scientific?—Yes.

By the Chairman:

Q. What practical benefit do you think the public is obtaining at present from the large expenditure of $92,000 annually for the Survey?—I could not say. As far as I have already stated, I consider that we are receiving no benefit. It may be of scientific value, but I cannot see that it is of any value to business men and capitalists.

Q. You have referred to the asbestos mines of the Eastern Townships, and that there is no information in the Department regarding them. Is it not a fact that this is an exceedingly interesting discovery and has attracted a great deal of attention in the last few years?—Yes; more especially in the last few years.

Q. Do you not think that it was a question of such geological interest that it should have attracted the attention of the Survey?—I should imagine so. In that case, as in the others, I was obliged to go to private parties to obtain the information I desired.

HOUSE OF COMMONS, OTTAWA, 28th March, 1884.

The Select Committee on Geological Surveys met this afternoon, Mr. HALL in the Chair. WILLIAM McINTOSH, Esq. of Buckingham, P.Q., was called and examined.

By the Chairman:

Q. You have been connected for some time with the phosphate interests in the Ottawa Valley, have you not?—I have been connected with the phosphate industry for three years in the vicinity of Kingston, and for three years in the vicinity of Ottawa.

Q. How long is it since the phosphate deposits in Canada have been worked for their commercial value?—They have been worked for the last twelve years, to my knowledge; of course, they were discovered some time before that.

Q. Will you give to the Committee an idea of the extent and value of the phosphate deposits in Canada?—Phosphate is found in the County of Frontenac, in Ontario, in a great many of the townships there, including Bedford, Loughboro, Storrington, Sherbrooke, &c. Phosphate is also found on the line of the Kingston and Pembroke Railway, and although the deposits are not so great as those in the Province of Quebec, they are equal in quality, where found in large beds, but they are more on the surface.

Q. About what percentage do they range from?—In Ontario, for the last four years they do not average over 76 or 77 per cent.

Q. How extensive are the works in that district in developing these interests? Has a good deal of attention been paid to it?—Large works were carried on by the firm of Scheiff & Fleursham, of London, Eng., which were the most extensive. They went to the depth of about 150 feet. That is, at North Burgess, back of Perth. I was connected with those works.

Q. What was done with that phosphate?—It was shipped to England in its raw or crude state. The quality and quantity when they quit work at that depth was equal to what it was on the surface. There were other extensive works caried on there under the supervision of Mr. Davis. I think Capt. Adams and Messrs. Gillespie, Moffatt & Co., of Montreal were connected with it.

Q. What was done with that phosphate?—That was also shipped to a foreign market.

Q. Are these works still being carried on?—No, not so extensively.

Q. Approximately, how many hands were employed in the development of the phosphate interests in that section of country, when you were there?—Probably

300 or 400 men. In the vicinity of Storrington and Bedford a great many farmers have it on their properties in small pockets or deposits, and they mine a few tons of it during the summer time, and take it to Kingston, where they always find a market for it.

Q. What do they realize for it?—The average price I have paid for it was $12 to $14 a ton, according to the quality.

Q. Will you now explain to the Committee the extent and nature of the work that is going on here in the Ottawa Valley? Over what section of country does the phosphate extend?—The most extensive work is now being carried on at the Rivière aux Lièvres. To my knowlege the region where phosphate is to be found is about thirty miles in width, and I have been as far as 100 miles to the north, and found it.

Q. So that you have reason to believe that that country is underlaid with phosphate of a greater or less richness.—Yes.

Q. What is the output?—The Union Phosphate Mining and Land Company has given out about 3,200 tons during last year. At this mine a year ago there was not a tree chopped, nor a road to the works, and at the present day we employ eighty men, and we have steam drills, hoists, tramways and cobbing house. This is an American company, and we have stored at the station to date 2,850 tons. The High Rock Phosphate Mining Company, adjacent to ours, has given about 5,000 tons during the past year, of which about 4,500 tons have been stored at the station. The output of the Emerald Phosphate Company has been about 3,000 tons, and of the Dominion Company about 1,200 tons. There are also several other mines in operation, which are worked by private parties on a small scale.

Q. Would you give the Committee an approximate idea of the gross output in that region?—The output during the last year—that is from last spring to this spring—and stored at Buckingham station, is about 14,000 tons.

Q. What quality of ore do you bring to the station?—Anything over 75 per cent. is considered a marketable phosphate.

Q. And anything under that?—It is hard to find a market for it. We never bring ore to the station that is less than 68 per cent. We do not send anything below 75 per cent. to England, and the grades between, say 68 and 75 per cent. we find a market for in this country, probably at Chicago, and anything below 68 per cent. is considered as refuse and unfit for shipment.

Q. Then, of course the real product of the mine, including what you call refuse, is vastly more than these figures you have given?—Certainly.

Q. How many men are employed to produce this output?—From 300 to 400 men are employed in this industry in that section of country.

Q. Is this ore that is brought from the mines to the railway station sent away in its raw state?—Yes; all of it.

Q. None of it is manufactured into fertilizers in this country?—But very little, to my knowledge.

By Mr. Dawson:

Q. Where is it sent to?—England and Hamburg (Germany), are the chief markets.

By the Chairman:

Q. What is the cost of freight from the railway station at Buckingham to the European ports?—About $7 a ton, on an average.

Q. What range of prices is realized in England and Hamburg from the sale of this raw phosphate?—The average price per ton for a guarantee of 80 per cent. during the past year, has been from 1s. ½d. to 1s. 3d. per unit 1s. ½d. per unit would be about $22.45 per ton.

Q. How much cash does your company disburse there in a year?—Since we began, we have disbursed over $60,000, and we have been working only one year.

Q. Have you induced a good deal of American capital to come here for investment in these mines?—Yes.

Q. There is some English capital invested there also, is there not?—Yes; it is the success of the High Rock Company that has attracted the attention of capitalists, and induced them to invest in other properties.

Q What assistance, to your knowledge, has the Geological Survey of Canada ever rendered towards inducing either foreign or domestic capital to be invested in the development of the phosphate interests?—None, to my knowledge. I find it one of the greatest difficulties to induce capitalists to come here without showing them the practical results of my working. We have nothing of the kind to refer them to, to get reliable information, in the way of reports made by scientists or anything of that kind.

By Mr. Dawson:

Q. If they come to the Geological Survey here they could get no information?—No; I knew of some parties who came here, and they went away disgusted.

Q. They would be just as likely to throw cold water upon it as not?—I never saw these parties afterwards. There have been scientists there exploring, surveying, mapping, etc., and I cannot get any information that is worth anything to me, nor can I get any report with anything in any part of the volumes issued by the Geological Survey. The only two I know of are Dr. Harrington and Mr. Willimott, and their work was devoted to East Wakefield and East Templeton. So far as the Rivière aux Lièvres, where the biggest deposits and the largest works are, is concerned, I cannot find anything in the Geological reports of any benefit. There was a Mr. Vennor, who labored in Buckingham, but I cannot find any report. They have whole pages written on private properties, but there is nothing to attract the attention of capitalists, either in England or the United States. Last year our company made a special business of bringing it before the Americans, and I have written several letters to the *Mining Record*, of New York, and also to my principal, Mr. Williams, and I see, at a meeting held in the United States, Dr. Hunt read a report on the Canadian phosphates, which will do a great deal of good. He has given some practical information which he got from the Manager of the High Rock Company, which produced as much as all the others together, until last year. It is difficult to get information from any other source than from these companies themselves. They have brought scientific men from the State of Pennsylvania to report upon it. So many people have been led astray by false statements, that we want something in the form of reliable reports, that could be relied upon by the investor or purchaser, and to which we could refer them. I noticed these remarks of Dr. Hunt, and I thought they would do a great deal of good.

By the Chairman:

Q. This essay by Dr. Hunt was recently read before the American Society of Mining Engineers, and had no connection whatever with the Geological Survey of Canada?—There is one other thing to which the attention of the Survey should be directed—at present we have to do it amongst ourselves, and we do not propose to do it for the benefit of the whole country—and that is, to ascertain the extent of the phosphate deposits. That question has often been asked me, and has never been answered yet.

By Mr. Dawson:

Q. You mean the extent of country?—Yes; and also the depth. It has been found to the depth of 150 feet, and the desposits are, to my own experience, larger as we go down. Although they are intersected every 12 or 15 feet by rock, they are in pockets, and get larger as they go down.

Q. You have no reason to believe that they die out?—If experiments were made which would lead to the putting in of expensive machinery, my impression is that we might go down 300 or 400 feet as easy as we now do with the whim and horse. In order that this difficulty might be overcome, test holes might be made with the diamond drill, in the vicinity of where the largest deposits have been found, to the depth of 500 to 1,000 feet; it would not be very expensive, and it is really a thing which should be done by the Government, in the general interests of the country.

Q. Do the leads go pretty uniformly down?—Where you get into the centre of the hill, the deposits go down pretty vertically.

Q. Do they keep a uniform shape in going down?—There is no such thing as a phosphate vein. It occurs in deposits or pockets, and is found in the leads of pyroxene rocks.

Q. Would that not operate against the diamond drill in boring it, because if the rock is corrugated, it might be reached and still be missed?—If you take an angle of 45° you would cut the leads.

By the Chairman:

Q. You think that the principal rules which govern these deposits ought to be determined by the Government or by the Geological Survey?—Undoubtedly.

Q. Would you give the Committee your opinion as to the value and importance of procuring and preserving mineral statistics in some office like that of the Geological Survey?—That would be of the greatest advantage to practical miners like myself, to get a report of what has been done in each of the mines and put it before the public, and it would be just the thing to induce capitalists to invest their money. The only visit ever paid me from the Geological Survey was last summer, by a Mr. Torrance, who was equipped with very poor tools—I might say they were not fit to send a man to the field with—and, to the present, I have heard nothing of the results of his operations. I think the people of this country ought to get the benefit of this information at the exact cost of printing and publishing, and there should be no commissions on it to book-sellers to increase its cost.

By Mr. Dawson:

Q. Would it not be greatly to the advantage of the phosphate industry if people going to the Geological Survey were able to get reliable information regarding it, and would it not lead to the development of the country if strangers and capitalists coming here were able to get reliable information?—That is just what we want, and would greatly facilitate our work. So far we have had a hard time of it, in working up the business and showing that there is money to be made at phosphate mining by practical work. One thing, however, that would greatly aid us in inducing capitalists to invest, would be to make use of our refuse. Something must be done in this direction; I have spoken to several capitalists about it, and they seem willing to take hold of it. I am speaking of the manufacture of fertilizers, super phosphates, and other powders, that could be manufactured along with the same business. There is a large amount of phosphate, from 60 to 65 per cent., which is at present wasted, and if this were manufactured into these fertilizers, we could make our quality much higher and much more uniform for shipment. If this refuse or waste were utilized in this way, it would almost pay the working of the whole mine. Another which might be mentioned is that we have large deposits of copper pyrites, which contain a good deal of sulphur, and which is very injurious to the vegetation close by, and this might be used in the manufacture of fertilizers, if some encouragement were given to a company in the way of a site for the buildings, free from taxation, and their machinery be allowed to be brought in free of duty. In the Province of Quebec a large quantity of superphosphates was brought from France by the Provincial Government, and distributed round to the farmers, but I am sorry to say it was of poor quality, and some of it is lying at the stations yet. If the Government, after a company was established here, would take so much of the manufactured article and distribute it round to the farmers and get a direct report as to the benefit of it, they would open up a market for the manufactory, after it got into good running order. Our farmers here are not educated to use fertilizers, and that is why I think that method should be adopted to establish a sale of the article, and in doing so they would be greatly assisting in the development of the phosphate industry.

Q. You have no reason to suppose that phosphate extends beyond the region or tract of country you have mentioned?—I have no reason to doubt it.

Q. It might extend up the Ottawa here?—We cannot tell. There is said to be some back of Quebec. Of course my statements are all practical and of my own knowledge.

Q. And you have reason to believe that the area over which it extends is much greater than you have mentioned?—I have no doubt it extends over a much greater area.

By Mr. Holton:

Q. Are you a geologist?—Nothing more than what I have read.

Q. You are a practical miner?—Yes.

Q. Has your experience, as a practical miner, been gained in this country alone?—No.

Q. Are you acquainted with the Geological Surveys of other countries?—Nothing but in Canada.

By Mr. Baker:

Q. Taking a hundred parts of phosphate, what are its component parts?—The following analysis of Canadian phosphate was made by Mr. G. H. Ogston, of London, England:

Moisture	·10
Water of combination	·50
Phosphoric acid	37·60
Lime	51·52
Oxide of iron and alumina	1·50
Magnesia, &c., not determined	5·18
Carbonic acid	·60
Insoluble matter	3·00
	100·00
Equal to tribosic phosphate of lime	82·10
Equal to carbonate of lime	1·36

Q. What price does the 75 per cent. article bring in England?—We sold it last year for 1s. 4d. per unit, and now it is worth 1s. 1d. per unit. That is for the long ton. The price per ton ranges from £4 7s. 6d. to £5.

Q. What price does the phosphate that ranges from 68 to 75 per cent. fetch in Chicago?—There have been no sales during the last two years; we cannot sell it.

Q. Could you sell it if the price were lowered?—It would not pay for shipment. What we sold was for $7 a ton at the banks of the Ottawa River. We could find a market for the high grade article at a good price; we could have sold 50,000 tons one year if we had had it.

Q. Do I understand that there is no appreciable amount of the phosphate manufactured and sold in Canada?—It was manufactured at Brockville and at Kingston, but not prosecuted to any extent.

By the Chairman:

Q. Is it not a fact that large quantities of fertilizers are imported into this country from the United States?—Yes.

Q. Is there any reason why it could not be manufactured in this country with equal advantage?—No; there is no reason why it should not be manufactured just as cheap.

Q. Then you think a company would be fairly entitled to a little encouragement from the Government to work up these raw material here?—Yes; it would be the means of bringing in a great many more capitalists. I understand that the Crown Lands Department of the Province of Quebec, which has a vast body of land rich in phosphates, is governed in its sales by information which it gets from the Geological Survey of Canada, and if so, they certainly labour under a great mistake, as that information is entirely unreliable. The attention of the Government should be paid to the prospector and pioneer, who is a most useful man in developing the mineral resources of the country, and calling attention to their value, and unless he is protected there is no use in his continuing his work. Just now some speculator very often gets the benefit of the poor man's work.

HOUSE OF COMMONS, OTTAWA, 29th March, 1884.

The select Committee on Geological Surveys met this morning, Mr. HALL in the Chair. EDWARD J. CHAPMAN, Esq, of Toronto, was called and examined.

To the Chairman:

I have been for thirty-one years professor of mineralogy and geology in the University of Toronto, and during the last five or six years I have acted as professor of mining geology and as saying in the School of Practical Science, Toronto. Before I came to Canada, I was professor for two years in the London University College, England, and I acted there also as a mining engineer. I might also say that I am a Doctor of Philosophy of Goegen, Hanover, and some few years ago the University of Queen's College honored me by giving me the degree of LL.D, although I did not belong to the Presbyterian body, and I am the author of some five or six works on these subjects, published within the last few years.

Q. Where was your geological education obtained?—Chiefly at Clausthal and various parts of England; also slightly in France; and of course to a great extent on this continent. In thirty-one years one always learns.

Q. During your residence in this country, in addition to your study of geological studies you have devoted a good deal of attention to practical geology and the mineral resources of the country, have you not?—I have made a considerable number of reports myself, which have been printed with maps on the mineral lands and deposit in various parts of the Dominion.

Q. What mineral section of the Dominion have you visited?—Chiefly the North Hasting's section, comprising Peterborough and Victoria, in connection with the iron industry, and also the north shores of Lake Superior and Lake Huron, as well as Cape Breton and Nova Scotia. I have published several works on mineralogy, and one work on the practical minerals, and how to work them, and another on the minerals of Central Canada.

Q. You have kept yourself informed, I suppose, as to the methods under which Geological Surveys are conducted both in this and other countries?—Yes.

Q. Did you know the late Sir William Logan?—Quite intimately and each work that he published. Of course I have not the opportunity of making surveys of late, being anchored a great part of the year in Toronto, so that my hands are to a great extent tied. I can only do laboratory work, &c. To show the number of people that come to me, I kept a record for one year (1882), and had 216 applicants, to whom I gave information, free of charge, about economic minerals. In North Hastings I examined some eight or ten properties, and almost immediately after I went to Echo Lake, near Lake Huron, for some Ottawa people, I think. When I got back, and before I had time to write the report, an American Company got me to go between Haliburton and Bancroft. They are now trying to get help from the Government to build a railway there. In Peterborough and Victoria I examined as many as thirteen different properties, collecting minerals and analyzing them. I once went to Sherbrooke, a good many years ago, to look at some copper deposits, and I also visited the Bay of Fundy for a gentleman in Halifax the north shore of the Grand Manan.

Q. Will you state to the Committee your impression as to the present system and administration of the Geological Survey of Canada, as compared with its system and administration under Sir William Logan?—I did not quite approve of the system as followed by Sir William Logan, and I have often told him so, but he said it was forced upon him, and he could not help it. I think, however, it is decidedly retrograding, from a practical point of view. Most of the reports now are purely scientific, whereas the Survey was clearly instituted to convey to the Canadian people practical information respecting the mineral resources of the country. Now they are almost all purely scientific, and really they are not intelligible to ordinary people, although of considerable interest to geologists. I may add that I have derived from them very great benefit in my position as teacher of these subjects, and more especi-

ally in the earlier reports. Nevertheless, I can quite understand that practical people will derive no benefit from them at all.

By Mr. Mulock:

Q. Just a handmaiden to the student?—Yes; and to the professor; and even then I had to devote much time and trouble to get out what was useful from a great mass of details.

By the Chairman:

Q. From a scientific point of view only are the late reports growing more or less interesting?—Much about the same. There is no doubt Prof. T. Sterry Hunt was a great loss, and his reports could be made use of by practical men. People even come to me from the States and say: Where can I find a geological report and map of such a district? I am obliged to say that it cannot be found, except in detached portions.

Q. Considering the wants of a new country and its desire to attract immigration and capital, do you not think the attention of the Survey should be more directed to our economic minerals and to our mineral resources and development, than to anything else, if we had not time to accomplish everything?—Most decidedly. A great deal of money seems to be expended in the minute and microscopic examinations of fossils, &c.; most valuable, it is true, but I think they should be made at private cost, and not worked out at the public expense, because they are practically useless, except from a scientific point of view. Indeed, if I may be allowed, I might say that the present reports seem rather to be addressed to the Geological Society of London or the geological section of our Canadian Royal Society, instead of to the people at large. Sir William Logan considered that the primary object of the Survey was to collect and afford practical information regarding the mineral resources of the country. I am sure in his life you will find that stated, when Mr. Draper, who was at that time Premier, told him: "If you can show that really any practical results will accrue from the Survey, well and good, and no doubt we will find the money for it, but the Legislature will never vote any money for a purely scientific research." We have drifted into that, I am afraid. These gentlemen want, naturally, to make a scientific reputation.

Q. They feel more pride in establishing a reputation abroad among scientists than they do in establishing a reputation amongst the common classes of the country?—Most undoubtedly; it is a natural inclination of scientific men, and I do not altogether blame them, from their professional standpoint.

Q. In what estimation is the Geological Survey held at present, as compared with its reputation in foreign countries, in the time of Sir William Logan?—I am hardly prepared to give an opinion upon this subject. It would take a long time for the reputation which it had to diminish, and then there has been no opportunity of seeing any remarks in scientific papers or journals upon these late reports, because they are all too recent. I have not the slightest fault to find with the reports, as scientific reports, but I certainly think they ignore the primary object for which the Survey was instituted.

Q. You have spoken about a great many enquiries having been made of you, in consequence of your familiarity with our mineral resources. Are they not the kind of enquiries that would naturally be made of a Geological Survey, properly conducted, in such a country as this, and should not those parties making these enquiries be able to get practical information from the Survey?—I should think so. It is stated in the last volume of reports, that information is being constantly given to applicants at the office of the Survey, and I have no doubt that is the case.

Q. To put it to a practical test, you have never made any enquiries?—No.

Q. Would you give to the Committee, in brief, your impressions, from the observations you have made yourself, as to the extent and value of some of our mineral resources, particularly the iron deposits in the neighborhood of Hastings, to which you have referred?—I may reply that there are numerous very valuable deposits of magnetic iron ore and hematite in the more northern parts of the counties of Victoria, Peterborough and North Hastings, as well as in other parts of both

Ontario and Quebec, but those mentioned are more especially known to me. Some of these deposits are of great extent, practically inexhaustible, and of great richness and purity.

Q. Of what percentage?—It is not so much the percentage of an ore that the smelter looks to as its purity. They run from 60 to 65 per cent. and are, as a rule, practically free from sulphur, phosphates and titanium, &c.

Q. Have these deposits attracted a great deal of attention from the public during the last few years?—Yes; especially from the capitalists of the United States.

Q. Are you aware that almost all those large deposits have been secured by American capitalists?—A great number of them, probably all that I have visited, a very few being in the hands of Canadians.

Q. Could you give us some idea as to the amount of capital invested there or the number of people working at those mines?—The greater number of them are not worked. Some gentlemen connected with the mines there are trying to get aid from the Government for a railway. The Wollaston mine, which I examined, is largely worked, and some 200 men or more are working there.

Q. Do you think much public attention has been called to these rich deposits by the Geological Survey of Canada?—Decidedly not.

Q. Do you not think it is a field in which the force and energies of the Survey should have been directed?—I think so; in fact, all these deposits have been found by explorers, who go in and report upon them. As regards the officers of the Survey, most of whom are well-known to me, there cannot be any doubt, in my opinion, of their scientific ability. Dr. Selwyn, the Director, is undoubtedly a very able geologist, but of course I know nothing of his method of arranging matters with his staff, or of the internal arrangement of the Survey. Dr. Bell, Dr. Dawson, Mr. Whiteaves, Mr. Hoffmann, and Mr. Fletcher, the latter being an old student of mine, are undoubtedly the best men that could be found for their positions. The more subordinate members of the staff, with the exception of Mr. Tyrrell, also a student of mine, are personally unknown to me, but I have no doubt that they are equally efficient.

Q. The material, then, which the Government have within their reach for the construction of a Geological Survey, you think is ample and of the very best quality?—Yes; of course they could always get specialists for special work.

Q. Then you think that any failure to obtain practical results in the Survey would be rather in the system than in the *personnel*?—Quite so.

By Mr. Baker:

Q. You think the necessary geological material is there, if properly distributed and administered?—Yes; there is the machinery, if properly handled.

By Mr. Cameron:

Q. Do you consider the publication of geological maps important in connection with the reports?—I consider the publication of these maps exceedingly important, but I think that smaller maps of a convenient size—index maps, if they please to call them so—should be published at once, accompanied by a plain report, explanatory of the map itself, and giving lists of economic minerals, with their analyses, current values, and other points of value in connection with them, and if these reports could be accompanied by a few plates, showing commonly occurring distinctive fossils, their value would be greatly enhanced. Some of these maps might be issued with very little delay; others would necessarily require a longer time for their preparation, but I think in every case a certain limit of time should be fixed and at its expiration the best results that could be collected within that limit should be given at once to the public. In the United States small volumes are frequently issued containing matters of this kind, and at a very low price. Some of these lithograph views and photographs in the Canadian reports are more suited to a work like "Picturesque Canada" than to a geological report.

Q. How often are they published?—Only from time to time. A man came to me the other day and asked me about maganese. I told him that the principal deposits were in New Brunswick, and he said: "Where can I find a good, plain description of those; with maps?" I could not tell him where to find them. They have now issued

these very fine maps, but that is not what the gentleman wanted; he wanted something more simple.

By Mr. Wood:

Q. Would the publication of these maps you refer to require much time?—They do, if you enter into too much details; but it should not take much time to issue one of these plain maps, as there should be plenty of material, as the Survey has been going on now for about forty-two years.

Q. You think that with the amount of time and money which has been spent there has been quite time enough for any work of this kind?—Yes; as regards the more remote districts of British Columbia and along the Rocky Mountains, very great scientific detail is not at present needed.

By Mr. Cameron:

Q. Are you aware that there are large deposits of manganese in Cape Breton?—No; they had not been found when I was there. I was shown some samples there, but I have always been careful about these things, as I have been so often deceived.

Q. You spoke about Mr. Fletcher, who worked in Cape Breton. Do you not think it is an unreasonably long time to have these reports delayed for five years?—Certainly; of course the answer would be that they would be making them more complete. If I had anything to do with it, I would take up and complete one or two districts at a time, and publish, at as early a date as possible, index maps, showing broad, general features, irrespective of minute scientific details. This map should be accompanied by a short, plain report, explanatory of its leading features.

By Mr. Wood:

Q. What staff would you require to do that?—It might be done at once, and where so much of the ground has been gone over, a very small staff would be sufficient. Of course, I can hardly say what materials they have collected.

Q. But suppose you take a few years back, what staff would they require?—Probably four or five men, but they need not all be skilled geologists.

Q. Would you require more than one skilled geologist?—One ought to be able to bind all the work together.

Q. That is, one skilled geologist, with three or four assistants?—Yes.

By Mr. Dawson:

Q. You have written several works on geology and mineralogy, have you not?—Yes; five or six.

Q. I know that they are very generally read throughout the country by scientific institutions, colleges, &c., are they not?—Yes.

Q. You have stated that the present staff of the Geological Survey are only anxious to distinguish themselves abroad as scientists. Do you think that this report, containing all that they have done for 1880-81-82, will add very much to their reputation abroad?—It will attract attention. There is Dr. Dawson's report on the coal of the Bow and Belly River Districts, in the North-West, which will certainly attract attention abroad.

Q. But take it all together, is it not a very poor result for three years' work, for the public at large?—Yes; for an expenditure of $90,000 annually.

Q. Do you think that these changes in the nomenclature of our rocks, and the introduction of new colors as designating certain descriptions of rock—do you think this is advisable, or do you not think it would have been better to adhere to the old colors and methods?—I think it quite legitimate for the Director to use what colors he wants, so long as he publishes an explanation of them.

Q. Do you not think it would lead to confusion in nomenclature throughout the world?—I think there is no strict rule for coloring geological maps.

Q. Any geologist may adopt any coloring he wishes for his geological explanations?—Yes; I think so.

By Mr Baker:

Q. Would it not be better if he used the coloring and expressions that have been used long before?—I think it would have been better if he had kept to Sir William Logan's colors.

By Mr. Dawson:

Q. You say you have examined the country about Lake Huron and Lake Superior?—Yes.

Q. And that country is very rich in minerals, and from the character of the rock you would think that it would be a very important region as regards minerals, would you not?—I think so.

Q. You have seen the silver mines of Lake Superior?—Yes.

Q. The Silver Islet mine turned out remarkably well, and from the character of the country, I suppose you would imagine that it would be safe to predict that it would become a very important silver-bearing region in time?—I think so; although many people may burn their fingers by opening them; but, of course, these experiments have to be tried.

Q. Then there are also very valuable copper deposits on Lake Superior and Lake Huron; if utilized, they will become valuable?—Yes.

Q. As they have done already at the Bruce mines?—The Bruce and Wellington mines are practically pretty well played out.

Q. But they yielded large and handsome returns at one time, and a great deal of money was made there?—Yes.

Q. And there are similar ores along Lake Huron, at Echo Lake for instance?—Yes; some fifteen miles back from the lake in Echo River.

Q. There are also abundant indications of copper along Lake Superior, are there not?—Yes; but they have not yet been opened out.

Q. Except at Michipicton Island and Maimause?—Yes; but not successfully.

Q. At Maimause they say they are successful now?—It is hoped so, but it has been taken up and dropped several times.

Q. I think you have explained yourself pretty fully as to the greater value our Geological Survey would be if there was some office or Mining Bureau attached to it, where people could get information as to the prospective value of the mines being found?—Yes; I think that would be an important addition to the work of the Survey.

Q. And such an office as that might very well be connected with the Geological Survey?—Yes; indeed some years ago, when I was consulted by the Hon. Sandfield Macdonald, on the subject of establishing a School of Mines in Ontario, I said to him that there was scarcely the necessity of going to that expense, but that I thought a Bureau of Mines, where trustworthy information could be obtained, might be very legitimately established. Doubts might naturally be cast on reports made by private individuals, on the supposition that they were not strictly impartial, although no doubt would be cast upon the honesty and ablility of the gentleman giving the report.

Q. You have expressed the opinion that capabilities of the members of the staff of the Geological Survey are fair and good, but that it seems to be in the administration of the Department that the failure to give general satisfaction exists?—No; I could hardly say that. I know nothing of the internal working of the Survey. I should hardly like to say that the Director is at fault; I believe him to be a thoroughly good geologist.

Q. And all his staff are good men?—Yes. I think they seek to enter into too many scientific details, by which practical matters are lost sight of.

By Mr. Baker:

Q. I understood you to say that, in a large extent of territory like that of British Columbia, it was not necessary to prosecute the work of the Geological Survey with the same degree of minuteness as in other Provinces?—What I meant was, that in the Rocky Mountain district of British Columbia and the North-West Territories it was not possible, at present, to enter into very minute details or a lengthened examination. What we want there is careful exploration.

Q. You are of opinion that it is valuable to expeditiously publish these small reports, with maps, according to sections of country?—Yes; even if they were only rough sketches or index maps.

Q. They would be more valuable immediately than waiting for a long exhaustive report?—Certainly.

Q. Have you ever been west of the Rocky Mountains?—I have been to Colorado, but I have not been as far as the Rocky Mountains on Canadian territory.

Q. Have you any personal knowledge of the mineral wealth of British Columbia? —No; except in making assays of ores which were sent to me by various parties.

Q. What samples of ore have you had?—Copper, gold, coal and iron ore, from British Columbia. Amongst others, I may mention that I have made analyses of iron ore from Texada, for Mr. DeCosmos.

Q. Has no ore been brought to your notice from the Howe mine, at Jarvis Inlet, British Columbia?—Very frequently they do not tell me the exact location, for fear I might give information to enable parties to "jump" the land.

Q. Then you really do not know that there is valuable ore in British Columbia? —Judging from the character of the rocks, as already known, I should say that there must be many valuable mineral deposits in British Columbia.

Q. But you have no personal knowledge as to particular districts in which these deposits are?—No.

Q. Have you seen any very valuable copper ore, and if so, what percentage has it been?—I could hardly tell that.

Q. Is it a high grade or low grade ore?—High grade ores. A copper ore holding 3 per cent. is considered good. The Cornwall ore, in England, when brought to bank rarely exceeds 2 per cent., but by dressing, the richness is, of course, brought up to about 20 or more per cent. The copper ore from the Bruce mines averaged, before the mines were closed, no more than 1½ per cent., but were brought up by dressing to 21 per cent., before being shipped to Swansea.

Q. Then, you have not seen any of the high grade copper ore from British Columbia, averaging 65 to 70 per cent.?—No.

Q. Is it not usual in copper deposits to find large deposits of silver underneath? —It is very unusual.

Q. But copper is sometimes found in veins with very valuable metal?—Yes; there is, of course, no reason why it should not be so; but it is unusual for silver to be found with copper, in large quantities.

Q. But the native copper of Lake Superior is associated with small quantities of native silver. In valuable copper ore, are not gold and silver very important factors? —Not as a rule. Nearly all copper pyrites holds a little gold, but as a rule, it would hardly pay to take it up.

Q. You have already stated that you have no personal knowledge of British Columbia. Have you any knowledge, from hearsay, of the economic value of the coal deposits of Vancouver Island?—There is no doubt that they must be very great. There have been some very good reports published in former years on the coal deposits of Vancouver Island. At any rate, these reports served to impress people with the value of these deposits, from a mineral point of view. I have examined some of the samples, and they are really nearly as good as the bituminous Ohio coal.

Q. And how do they compare with the old country coals?—As a rule, it is somewhat inferior to the Wallsend or Milford Haven coal, but still it is very good coal.

By Mr. Dawson:

Q. The coals of the North-West and of Vancouver Island are in a very different geological horizon to the carboniferous coals that come from Europe?—Yes.

Q. In fact, it is quite a new discovery to get good coal so high up in the series? —Yes, when first made. The old term, carboniferous formation or period, refers to the fact that workable beds of coal were supposed to be limited practically to that geological horizon.

Q. So that this coal of the North-West, which may be designated true coal, belongs to a much more recent formation, and is in a different horizin, geologically speaking, from what it was supposed at one time true coal could exist?—Yes; except ordinary lignite, which has been known for years to occur in the Cretaceous and Tertiary formations.

Q. But this ordinary lignite or brown coal was never supposed to be true coal? —It is a coal, but not, of course, the ordinary bituminous coal.

By Mr. Baker:

Q. Does the coal of Cape Breton, Nova Scotia, the North-West Territories and Vancouver Island, all come under the same category?—The Cape Breton coal is from the true carboniferous formation, the others essentially from the cretaceous.

Q. Is there any difference between the coal of Cape Breton and Nova Scotia proper?—No; not practically.

Q. Does the coal of the North-West Territories come under the same category, and is it of the same age and description as that found in Vancouver Island?—A good deal of it is essentially so; some of it a little more recent than others, but practically all the same age.

By the Chairman:

Q. We are informed by the officers of the Survey that the results of their work are shown by the Museum and by the published reports of the Geological Survey. Taking into account that the annual expenditure has now reached about $90,000 per annum, and having before you the volume of the geological reports for the three years, please state to the Committee whether you think the results, as thus indicated, are commensurate with that expenditure?—I cannot say that I do. Of course, I do not know how much matter may have been collected and witheld from publication at present, but judging from the reports actually issued, I certainly think that the sum of $90,000 per annum is greatly in excess of the practical results. I would certainly say that the practical results, as already published, are not commensurate with an annual average expenditure of $90,000.

Q. What suggestions would you make as to methods in which the system or administration under which the Survey is conducted could be improved?—As already stated, I think there is the greatest necessity for a speedy publication of small index maps, showing broad, general features, irrespective of minute scientific details. The Museum and Laboratory, I think, should be permanently maintained, so that persons applying for information, as regards the economic mineral products of any particular district, could readily obtain it there. I might also suggest lists of economic analyses, current values and other particulars of a practical character, together with mineral statistics of the districts generally. To sum up, my opinion is, that as at present conducted, the results of the Survey are of too scientific a character as opposed to practical results.

Q. In fact, they aim at too much?—Yes.

Q. And the more important practical results are to a great extent ignored in these reports?—Yes.

By Mr. Dawson:

Q. The fact is, that the Survey, as at present conducted, has too much of a geological and too little of a practical character?—Yes.

By Mr. Baker:

Q. Have you ever found that young Canadians are any more insubordinate or not amenable to discipline than young men of a similar age in England, or Ireland, or Scotland, or America?—I have had experience both in England and here. Of course lads will be lads.

Q. You do not think that young Canadians are less amenable to discipline than others?—No.

Q. It has been stated to the Committee that there is a certain amount of insubordination or want of discipline on the part of young Canadians. If that does exist, you are of opinion that a certain amount of tact would overcome it?—Speaking generally, yes.

By Mr. Dawson:

Q. It was stated that on account of young Canadians not being amenable to discipline, they were not so well qualified for positions on the Geological Survey as young Englishmen?—I should say one would be just as good as the other. I would

employ Canadians, other things being equal. Young Canadians are every bit as good, but not better, and of course if you bring young Englishmen out here they will not be so well posted with regard to the country as Canadians.

HOUSE OF COMMONS, OTTAWA, 1st April, 1884.

The Select Committee on Geological Surveys met this morning, Mr. HALL in the Chair. Alfred R. C. Selwyn, LL.D., F.R.S., of Ottawa, Director of the Geological and Natural History Survey of Canada, re-appeared before the Committee and was again examined.

By the Chairman:

Q. Since you were before the Committee, Mr. Torrance has completed and submitted to you his work for the last year in the Valley of the Ottawa, has he not?—Yes.

Q. What is your impression about the report, from the little you have been able to examine it?—I received it on the 28th of March. From what I have been able to examine of it, I consider that it is a good and useful report.

Q. It is in reference to the phosphates of the Ottawa Valley?—Yes. It is a report of fifty-nine pages.

By Mr. Holton:

Q. How many months' work does this report cover?—The instructions were given to Mr. Torrance on the 17th day of May, 1883, and this report was handed to me on the 28th of March. There is a map referred to, which does not accompany it, Mr. Torrance explaining that it was not quite ready.

Q. It is virtually Mr. Torrance's work of the year?—Yes.

By the Chairman:

Q. What action is taken by the Department in reference to a report of this kind, when it is presented?—It is submitted to me; I carefully read it and decide as to its fitness for publication—that is, whether it is fit for publication or desirable to publish *in extenso*. In every case where it is not published, an abstract is made of it, and is published in my preliminary report, the author's name being mentioned.

Q. Has this been the procedure with all the reports that have been submitted to you since your connection with the Survey?—Yes.

Q. Every report that has been submitted to you has been examined and either appears *in extenso* or an abstract made of it in your Report of Progress?—Yes; I go through them all and make corrections and suggestions.

Q. In the natural course of procedure, when would this report of Mr. Torrance's be given to the public?—Owing to the late date at which the reports are sent in, usually, there is not time to publish them—that is, to print them and correct the proofs—the same spring, and therefore they stand over until the following spring.

Q. So that the work, for instance, which was done by Mr. Torrance in the summer of 1883 will not be given to the public until 1885?—The spring of 1885 or the winter of 1884.

Q. Do you not consider that a change ought to be made in that respect, and if these reports are valuable, that the public should get some benefit from them without so long a delay?—I think it is often desirable, and moreover, it has been done in several instances. Dr. George Dawson's report on the coal of the North-West, which was considered of immediate value, and was published at once, is an instance of this. I think in many cases it would be desirable to do so; and in fact it has been the custom, and has been done repeately.

Q. You mean that they have been published in anticipation of the regular report of the year?—Yes.

Q. How many instances of that kind have there been?—I could hardly tell, but there have been several. Another report of Dr. George Dawson's, on the mines and minerals of economic value in British Columbia, was also published immediately.

Q. Have reports by other members of the staff than Mr. Dawson been published in that way?—No; because they have never been prepared in that way. The observations on economic minerals have always been embodied in the report. There are other reasons why this has not been done hitherto, and that is the question of expense. This no longer exists now, as the Government have been good enough to increase the annual allowance, and probably a system could be adopted now that was not possible before.

Q. These reports of Dr. Dawson's which were published separately and in advance of the regular volume were afterwards reprinted in the volume of the year, were they not?—Not exactly; in the reprinting of them there were considerable additions and amendments, the result of further observations.

Q. But the same work appears in the regular volume?—Yes.

Q. Is not the same remark applicable to the Report of Progress by the Survey? For instance, the work done for three years during 1880-81-82 was not published until the year 1883, and is just given to the public?—That is a matter of necessity. You cannot in all cases complete the work in one year. Observations have very often to extend over several years before the results can be given, and more especially has that been the case in view of the expenditure. It is not advisable to publish partial results, but that has to some extent been got over by officers publishing in scientific journals or reading papers before scientific socities, giving the results of their observations as far as they went. In that respect the system I have adopted is precisely that which prevailed under Sir William Logan. The whole system of publication has been similar, both as regards prior publication or publication with the annual report.

Q. Take, for instance, the phosphates of the Ottawa Valley. That section has been attracting a great deal of attention during the last two or three years, especially the attention of American capitalists. Do you not think that it would have been advisable that the work which was actually going on in that region should have been conveyed to the public in some form, so as to give intelligent information with reference to these phosphate deposits?—We can convey it in no other form but by the reports, and reports upon that have been published from year to year. If people will not read the reports we cannot help that. You will find a reference to the apatite not only in the last one, but there is the fullest reference in other reports.

Q. Take the report for the three years, 1880-81-82?—It does not represent three years' work, and that is not a fair statement to make.

Q. It is unfortunate, then, that that date should have been put on the volume?—That date is put on it to bring it up to the present time.

By Mr. Holton:

Q. Would it not be more honest to publish the volumes without any reference to dates at all?—I have no objection but it is stated in the report that it does not represent three years' work.

Q. I have looked through this last volume?—But you should have looked through the others.

Q. I have looked at this as a sample?—One volume is not a sample of the reports. The last one is an exceptional report.

Q. I think it is, and I think it is quiet a poor sample. It seems to me that our annual volume published annually as the Report of Progress should show the work done each year?—I think that has been done. The preliminary report shows the year's work.

Q. Then it should not be published as a year's report?—It is distinctly stated that it goes on from one year to another. The fiscal year and the callendar year are not the same, and therefore we cannot make them correspond. I have here a volume of reports issued by Sir William Logan and representing nine years' work, from 1842 to 1850.

By the Chairman:

Q. Those were the first years of the Survey?—The first nine years of the Survey.

Q. They did not commence work until 1843?—The report is dated "Montreal, December, 1842."

Q. But they did not go into the field until May, 1843?—As regards the reports, I may mention that in twenty years Sir William Logan published 2,200 pages, while in ten years I have published 3,800 pages as the work of the Survey. These are the facts, but now this report, 1880-81-82, which happens to be dated in a peculiar manner, simply to bring the date up to the time, and for no other object, is taken as a sample of the whole work, and I hold that that is very unfair.

Q. Will you inform the Committee what information the public have received in any other form than in this volume for the last two or three years?—A part of the work of 1880 appears in the last volume. There is a report of 1879-80, of over 700 pages, which is called the report of one year's work.

Q. That volume was published in 1881?—Yes.

Q. So that it clearly embraces no work since the year 1880?—I am not quite sure of that. There are reports of the Survey from 1875 to 1881—six volumes—in every one of which there are maps, illustrations, details about economic minerals, and yet this last volume is held up as a sample of the work. I put it to the gentlemen of this Committee to say whether that is a fair representation of the work of the Survey.

Q. I think it is confirmatory of the representation made to the Committee that the work of the Survey was not as efficient as it was formerly?—Why call particular attention to that report?

Q. Because it represents the most recent work of the Survey?—How does the size of the book prove the efficiency of the work.

Q. It proves the extent of it?—Take this report for 1880, which is the same date as the other.

Q. You do not quite understand me. It has been said that the work which has been going on for the last three years is not as efficient as the former work done by the Survey?—On what ground do they say so?

Q. I have stated that this Report of Progress for 1880-81-82 does not give evidence of the same extent of work as was previously carried on?—Of the last year only.

Q. It is three years' work?—It is not three years. In all fairness, you should take a few years back. To what particular work do you refer?

Q. Take, for example, the report of 1879-80. That was published in 1881, and therefore it contains none of the work that has been done since 1880? Is that correct?—I think so.

Q. Has there been anything given to the public since 1880, with the exception of this last volume?—There has been a great deal; there are other documents regarding the work of the Survey that have been given to the public, although not exactly in the form of a report.

Q. You now have an opportunity of correcting any misapprehension in that respect?—I cannot correct it, except by referring to the whole series of volumes by the Survey, and which must be done in order to arrive at a just conclusion.

Q. In addition to the work of these two years, as published in the volume of 1880-81-82, what work has been done?—A great deal of work has been done. It cannot all be done in one year.

Q. Cannot you specify it?—The surveys of the country and the maps which are in course of preparation. There is also the Museum given to the public.

Q. But according to your own statement the other day, the Museum has not increased very materially in the last twelve years?—I will ask any one who saw it in Montreal, and who have seen it here, if they can, in fairness, say that it has not increased.

Q. I am referring to your own statement the other day?—In Montreal the number of visitors in one year would probably be 1,600, while here we have as many as 1,500 in one month.

By Mr. Dawson:

Q. Then it is much better here than when it was in Montreal?—Yes; it is improved, and to whom is it due? Yet that volume is held up to represent the work of the Survey.

Q. That volume professes to represent the work of three years?—No; it simply represents a statement of the work that has been going on.

By the Chairman:

Q. During these years?—Yes; during those years. The results are not all finally returned yet; it makes a statement of the work, but in no sense does it represent all the work.

Q. What the Committee wish to get at is, what benefit it is to the public, other than through the Museum and the published reports?—I do not suppose the public are getting any benefit from the Survey, in a published form, but they are getting great benefit in an unpublished form, such as the giving of advice to miners in respect to mines. So much is that the case that I can show the Committee, by written proof, that in several instances the capital brought into this country, to work the mines, is due directly to my name in London, if that is any benefit to the country.

Q. It is, certainly?—I can give you conclusive evidence on that point. I will ask to put in this letter, which is written by a well-known geologist, whose reputation is world-wide, and who has been more or less identified with geological investigation in Canada for many years. The letter, which is from Mr. Jules Marcou, now resident in Cambridge, Mass., is as follows:—

"CAMBRIDGE, MASS., 42 GARDEN STREET, 10th October, 1881.

"Director A. R. C. SELWYN, Ottawa, Canada.

"MY DEAR SIR,—Many thanks for your kind letter of the 4th instant; the five volumes of Report of Progress, 73-74, 74-75, 75-76, 76-77 and 78-79, the notes on geological nomenclature and coloring of geological maps, and the index of colors and signs now in use by the Canadian Survey.

"I looked over some of the reports, reading only your own introductory report for each volume, and I congratulate you heartily upon the great work which you conduct with such ability and success, for those reports are more comprehensible, more important, and far above those published fifteen years ago.

"Yours devoted,

"JULES MARCOU."

That is from a gentleman I never saw in my life.

By Mr. Dawson:

Q. What is his position?—I cannot say; he is a professor at Harvard University, at Cambridge, Mass., I fancy. He is a well-known man, at any rate, and a man who is capable of judging of the value of reports.

Q. Had you only 4,000 copies of your reports struck off in former years as you have now?—Not nearly so many; about 1,500 in former years, I think.

Q. Then they are not generally circulated. A circulation of 4,000 is nothing for this Dominion?—There I quite agree with you.

Q. And they are sold at only two bookstores, Dawson's, in Montreal, and Durie's, in Ottawa?—I have to cut my coat according to my cloth. The liberality of Parliament, however, will remedy this; in the meantime, this vote has not been available, as it only took effect since the beginning of the fiscal year on the 1st of July. I quite agree with you that it should be sold at a merely nominal price.

By Mr. Cameron:

Q. I would like to ask if Mr. Marcou was a personal friend of Sir William Logan?—I do not know anything about his relations with Sir William Logan.

Q. You have no knowledge of any personal quarrel?—I do not know of any personal quarrel. There might have been a difference of opinion about the Quebec rocks, but that yet exists, and that could not be the cause of any personal quarrel. At any rate, I never saw Mr. Jules Marcou in my life.

Q. This letter may have been intended as a reflection upon Sir William Logan?—I cannot say.

By the Chairman :

Q. You have adopted the opinion of Mr. Marcou ?—No.

By Mr. Dawson :

Q. This difference of opinion with Sir William Logan may have led to the present opinion of Mr. Marcou, that the Survey is much better conducted than it was fifteen years ago ?—Mr. Marcou certainly had nothing to do with Sir William Logan, and as regards my ability to conduct a survey, I may read a reference made by the President of the Geological Society of London, also a man whom I never knew, in speaking of the death of one of my late assistants in Australia, Mr. Richard Danitree, C.M.G., whom I trained in geological work. The reference which I will quote is as follows : " In 1869 he was appointed Government geologist for North Queensland, whilst the late Mr. C. D'Oyley H. Aplin was appointed to a similar post in the southern part of the same colony. The Queensland Government were able to secure the latter gentleman's services through the parsimony of the authorities of the Victoria colony in breaking up one of the most complete Geological Surveys ever organized, except, perhaps, that of the United States Territories, under Dr. F. V. Hayden."

Q. Who was the gentleman who wrote that ?—The President of the Geological Society of London, in 1879, Mr. Henry Clifton Sorly.

Q. Dr. Hunt is looked upon as a very accomplished man, is he not ?—Yes, as a chemist and mineralogist and theoretical geologist, but he knows nothing about stratigraphical geology.

Q. Geologists differ among themselves, too. For example, at Thunder Bay, I believe, there is a divergence of opinion as to the Aminiki group. Dr. Hunt has written on that subject, and has published a very interesting report about it. I believe you have yourself written something on the subject also, and there is a difference of opinion as to the geological age or horizon which these rocks occupy, a difference equivalent to no less than 20,000 feet, vertically, in geological position. Is that not the case ?—Those are matters of investigation. I have differed with Dr. Hunt on certain questions of stratigraphical geology. A great many of Dr. Hunt's views are based on theory, and not on personal investigation of the stratigraphy.

Q. But Dr. Hunt investigated the rocks. He was a long time up at Thunder Bay, and examined them pretty thoroughly ; but I merely made the remark to show how geologists differ in opinion. They differ as much as these miners who are developing the mines ?—I told Dr. Hunt plainly that he had not thoroughly investigated the matter. I never write about anything which I have not personally investigated.

By the Chairman :

Q. I notice in your Report of Progress a reference to the work of a number of the members of your staff, whose reports do not appear in the published volume ?—Who are those ?

Q. There are a number of references, Mr. Fletcher's, for instance ?—Every report Mr. Fletcher has given me, except the last, has been published He writes his reports well, and is a very faithful worker and does his work well. The last has not been published, owing to circumstances.

By Mr. Cameron :

Q. This report was delayed on account of the maps ?—Yes ; it was partly owing to that and also partly owing to the late date at which I received the report. As I have stated before, we cannot stay in town and sacrifice the summer to get out the reports, and to get them out when they are handed in at this time of year would necessitate the sacrificing of all the summer's work. Unless, therefore, it is something specially interesting or of immediate importance, its publication is deferred until the next year.

By the Chairman :

Q. You had a Mr. Laflamme on your staff, had you not ?—No ; I employed him only last year to undertake an investigation, and here is his report, which I have gone through, and which is now waiting for publication.

Q When was the work done?—Last summer.

Q. Where?—In the Valley of the Saguenay.

Q. When was the report furnished?—I think it must have been at the close of the season, in December, probably; it was after I returned from the field, at any rate.

Q. There is no reference to that report?—No; but there is a reference to it in the Minister's report; full particulars of it will be published in the report of the Survey itself.

By Mr. Dawson:

Q. I suppose you would consider Prof. Chapman a good geologist?—Like Dr. Hunt, he is an excellent chemist and mineralogist, but he is not, I conceive, what we call a field or stratigraphical geologist. As an instance of this, I may say that Prof. Chapman published a report on the Haycock Iron mine, which I do not hesitate to say is entirely misleading, because he did not understand stratigraphical geology.

Q. Prof. Chapman took occasion to speak in very high terms of you, Dr. Selwyn, as being a very able geologist, although he could not say very much for the report, and I thought, perhaps, that the feeling was reciprocated, and that you had a very high opinion of him, but it seems you have not?—This letter which I hold in my hand has been in the hands of Mr. Simpson ever since I examined the mine, at the request of Mr. Simpson, of the Ontario Bank. After having been out to the mine and examining it carefully, spending a whole Saturday there, with Prof. Chapman's report in my hands, I gave him my distinct opinion about it. Referring to Mr. Vennor's report, which was published in one of our annual volumes, I found no information about this mine, and while I found no information about this particular mine, the Hull mine was fully reported on, full details being given of it. I have written to Mr. Vennor, asking him his opinion about the Haycock mine, which is given in the following letter, and which I may say entirely coincides with my own:—

"MONTREAL, 8th November, 1884.

"DEAR SIR,—In reply to yours of the 6th, I have always thought Prof. Chapman's report extremely visionary, as regards the probable quantity of ore in the Haycock iron deposit. The general conditions of this never struck me favourably. It is clearly a series of interstratified layers and masses in an iron ore horizon, which gives indications of the ore at very many points, but nowhere to any great extent. Prof. Chapman seems to think these layers and masses will or do run together into an extensive deposit in depth. Why? I see no indications of this, but rather the reverse. Most of the large deposits of iron ore in the Laurentian are the result of a fold of the layers or beds sharply upon themselves. Thus, the Seymour deposit at Madoc is a synclinal, the Hull mass an anticlinal; but the Haycock deposits are enclosed in a comparatively even or straight stratification. Possibly you read an article in the *Globe* of 4th November. This is clearly written in the interest of Mr. Haycock. In my humble opinion, though the quality of the ore is undoubtedly excellent, the mine has, so far, proved a decided failure. I would, however, conceive of its making a very considerable "show," were the beds upon the beds sharply folded upon themselves. I have traced the Hull (Baldwin and Forsyth) deposit for a great number of miles, but in no one place does it again assume such proportions as where folded over on the anticlinal near Hull. I do not think, Sir, you yourself would feel disposed to attach any weight to Prof. Chapman's wild estimate respecting the quantity of ore in this mine, although the report on quality is undoubtedly correct.

"Yours respectfully,

"HENRY G. VENNOR.

"ALFRED R. C. SELWYN, F.R.S., &c.,
"Director Geological Survey of Canada, Ottawa."

This was Mr. Vennor's candid opinion, and he probably did not give this opinion in his report, because he thought, had he done so, he would have been doing an injury to private interests.

Q. Might it not very often injure mining interests for geologists to express such opinions without sufficient investigation? It is to be supposed that these people, before they begin to open these mines, bring scientists and practical men to examine them, and are not these experts just as likely to know quite as much as the officers of the Geological Survey?—Certainly not; simply because they have not examined the geology of the country; they come here as perfect strangers and they know nothing about the country. It has been rather made a subject of attack that we have never reported on mines, and still you ask me whether we might not injure the mining interests of the country by making these reports.

Q. It is, of course very wrong for people to express these ideas without sufficient knowledge, but are not experts who have had considerable experience in mining in possession of as much knowledge regarding mines as the officers of the Geological Survey. The members of the Geological Survey are officers of the Government, and from their high position what they say has a very great effect; as, for example, a mine is supposed to be a good one, mining experts have pronounced it to be so, but along comes a geologist, strong in the spirit of controversy, with some fine-spun theory. He expresses an adverse opinion, and opinions thus readily expressed, without sufficient investigation, are very prejudicial both to the public interest and to the miner, whose credit is so far injured that he finds it difficult to get money to work these mines. Is that not very often likely to be the case?—I do not think it is likely to be the case, because no geologist will express an authoritative opinion. On the other hand, I have expressed opinions which resulted in bringing capital into the country. With reference to the Haycock mine, I may say that Mr. Simpson, of the Ontario Bank, came to me one day, and said, "Mr. Selwyn, I wish to consult you about a mining matter." I said, "Well, Mr. Simpson, I shall be very glad to give you all the information in my power." He said, "We have advanced very largely on this property, and I wish to get your opinion as to the value of it." I then said to him, "I know the Haycock mine by repute only; I have not been there, but I have read Prof. Chapman's report, and Mr. Vennor, of the Geological staff, has examined the whole country; he was requested to report on the minerals, including the iron deposits, and did so. I will turn to his report and see what information he gives about it." And what I have already stated occourred, namely, that I found no information. I then told Mr. Simpson that I was sorry I could not give him any satisfactory information about this matter. He then asked me if I could make it convenient to go out and visit the mine and give him a report. I said to him "We do not ordinarily make mining reports for private individuals, and it is not considered a part of the duty of the Survey to do so, but if you wish it particularly, I should like, for my own information, to see the mine, and I can go out some Saturday, if you wish, and give you my opinion." He sent a buggy to my house about eight o'clock in the morning of Saturday, the 4th November, 1882, and I spent the whole day there, carefully examining the mine, in company with the gentleman whom he sent out with me. When I came back I wrote to Mr. Simpson, distinctly stating my opinion, which was decidedly adverse, and I pointed out my reasons for coming to this decision, saying that I had not time to write him a long report. He then asked me who I would recommend to give him a report, and I recommended Mr. Hamilton Merritt. Some time after that I met Mr. Simpson, and I said to him: "Well, Mr. Simpson, what have you done about the mine?" to which he replied that Mr. Haycock was going home to England to raise more money to carry on the work. Later on—I am unable to give precise dates—but some months later, I met Mr. Simpson again, and I asked him what success Mr. Haycock had met with in England, to which he replied that Mr. Haycock had been very successful, and that the gentlemen who had taken this matter up, were sending out an expert to examine the mine, and on his report they would act. He also added: "We must keep him away from you Mr. Selwyn." I said that it was no business of mine, but if he came and asked me, I would give him my opinion candidly. The expert came out, and I never saw him, and I did not know who he was, or anything about him, but I found out afterwards quite acci-

dentally, having met this gentleman, Capt. Retallack, at Rideau Hall, and whose name had been mentioned to me by Col. Dennis, who was then asking my advice and opinion about some mines he was taking up in the Rocky Mountains.

Q. Was Col. Dennis then Deputy Minister?—No; he had resigned.

Q. It was quite recently, then?—Last year. I said I never met Capt. Retallack until I met him at Rideau Hall, and I associated him in my mind as being a Cornish mining Captain. Shortly after his name had been mentioned to me by Col. Dennis—I, supposing, of course, that he had had been been brought out by Col. Dennis—I was introduced to him at Rideau Hall, when I found that he was a military man and had been an A.D.C. in Canada. I had a long conversation with him about mines in general, and I asked him if he would not come and visit the Museum next day. He did so, and we had a very long conversation about mines and about the English capital invested in mines here. Incidentally the Haycock mine came up, and he asked me my opinion about it, which I gave him. I did not know then that he had ever seen it, but it turned out that he was the expert whom Mr. Simpson wished to keep away from me. He listened to all I had to say, but he did not tell me that he knew the Haycock mine or that he had anything to do with it. Shortly after he met Dr. Dawson, to whom he said: "If what Mr. Selwyn says about this mine is true, it is a very serious matter; I am heavily interested in it." Dr. Dawson said to him that he did not know anything about it, but he would look him up everything he could find on the subject, and I believe he did so. At that time Capt. Retallack had in his possession a prospectus marked "private and confidential," which was issued in London, and in which Capt. Retallack's and Mr. Haycock's names appeared, and also in which my name was most unwarrantably used.

Q. As dooming the mine?—No; as speaking highly in favor of it.

Q. Whereas you doomed it?—Most decidedly.

Q. The mines of the Eastern Townships, for instance, do not owe much to the Geological Survey, for they have been adversely reported on and represented as consisting of pockets in rocks folding back on themselves, and so disturbed that no continuous lode could be found. Yet these are now yielding handsome returns and giving employment to a large number of people. Is not that the case?—I deny that altogether. I am not aware that it is the opinion of geologists.

Q. The other day we had evidence from a very high source that these mines were now being worked at an annual expenditure of a quarter of a million of dollars, and that some of them had proved very valuable?—What mines are those?

Q. I do not know the names of the mines; but I think they are near Lennoxville. The Haycock mine itself might prove very rich, might it not? We have instances of that kind in Lake Superior?—That is all supposition.

Q. Yes; I fancy there is a great deal of supposition?—That is the opinion of certain geologists, but the proof of the pudding is in the eating of it.

Q. But the Silver Islet mine was reported against, and still they have taken a good deal of valuable ore out of it?—Will you state what report?

Q. I am not here to answer questions, but to ask them. It was generally supposed that there was nothing to be found there, and then Mr. Macfarlane went up there and reported on the mine, taking with him $15,000 worth of specimens down to Montreal. He and Col. Sibley came and developed the mine, and they took out three or four millions of dollars?—Has that anything to do with geology?

Q. The country generally was run down there?—I cannot refute the statements of geologists generally

By Mr. Wood:

Q. Has the Haycock iron mine been worked or developed at all, since?—No; it is standing still, as far as I know. Large sums of money have been expended upon it, but not since the period I have spoken of.

Q. Not since you gave that opinion?—No.

Q. Then there is no means of ascertaining from actual experience whether your information with regard to the mine is correct or not?—That can only be done by further sinking.

Q. And that has not been done?—No. Of course, I have other ways of supposing that I have been correct, which these experts who go out there have not.

By the Chairman:

Q. Are there practical tests made in the chemical department of the Survey of ores that are sent in?—Yes, constantly; every report shows it.

Q. Are the records of these examinations kept?—Yes; precise records.

Q. And dates fixed to them, so that the matter might be tested afterwards?—Yes; most of the tests made in the Survey are not those of developed mines. They are specimens sent in from all parts of the country.

Q. Can you tell, from recollecting in reference to any tests that have been made of the iron deposits of the Eastern Townships, as to whether they were condemned or approved?—Dr. Hunt made all these.

Q. But recently, within the last five or six years?—We have not made any recently, that I am aware of.

Q. An impression prevails there that the Geological Survey reported that the iron deposits of the Eastern Townships contained titanium?—That was Dr. Hunt's report long ago.

Q. Did he, as a matter of fact, report so?—Yes; it is my impression that he did so. However, the analyses are given in the report. The facts are there.

Q. But the most thorough tests that have been applied to them show that they contain no titanium?—That may be deposits not tested. Of course, I am speaking on the authority of Dr. Hunt, supposing him to be a first-rate chemist.

Q. A report has been sent to the Committee to the effect that in consequence of a report made by you in reference to the Acadia Charcoal Iron Company, the directors of that company passed a resolution making a contribution to you of $700 for that report?—In 1872, Mr. Livesey, of the Londonderry iron mines, asked me if I could examine and report on this mine. I gave him the answer which I give to everybody, that as a rule we did not give reports to private mining companies without permission or instructions from the Minister. Mr. Livesey, as I believe, was connected with Sir Hugh Allan in relation to this mine. Sir Hugh Allan got permission from the Minister for me to go with Mr. Livesey and make the report. I did so, spending considerable time there. I carefully examined the whole property, and made a survey of it, and transmitted the report, when finished, to I forget whether Sir Hugh Allan or not. Sir Hugh Allan's letter to me was as follows:—

"MONTREAL, 8th June, 1872.

SIR,—We have arranged with Mr. Livesay that we are to ask you to go down to Nova Scotia and give us a report on the iron deposits of Londonderry, and the coal areas he proposes to sell to us at Springhill.

We especially desire to know the probable quantity of hematite ore, and whether it may be regarded as of such permanent continuance as would warrant us in fitting up expensive works.

"Yours truly,

"HUGH ALLAN.'

Some time afterwards Mr. Livesey asked me whether I had received a cheque from Sir Hugh Allan. I said I had never heard anything about any cheque whatever. He then explained that they had been so satisfied and pleased with my report that they had unanimously decided to make me a present for the work I had done for them. The amount, I think, which Mr. Livesey mentioned, was $500. On the 27th June, 1874, I received the following letter from Mr. Livesey:—

"HALIFAX, 27th June, 1884.

"MY DEAR SIR,—Your note of the 18th, addressed to the mines, has been forwarded to me here. I am now writing to Mr. Stephen, and will incidentally request him to remind Sir Hugh of his shamefully neglected duty. I have also communi-

cated your message to Mr. Gould. You don't allude to your expected visits to these parts, but I trust it has not been abandoned or adjourned. It would give me much pleasure to see you at Springhill, where, in a few days, we shall have our English boring machine in operation upon an important, but problematic, portion of the coal-field. Please write or telegraph me to the iron mines, Londonderry, a few days before you start. If there is, as I believe, an official plan of Springhill on a pretty large scale, I should be glad to receive a copy, if not against regulations. It would be extremely useful to us in our explorations. If a tracing has to be made of it, I will repay the cost.

"Yours faithfully,

"JOHN LIVESEY.

"A. R. C. SELWYN, Esq., Montreal."

After this again I met Mr. Livesey—I cannot remember the date—but he again asked me if I had received this money, to which I replied that I had never heard anything more about it. He then handed me a cheque for $200, which, he said, he considered was his share of the amount awarded. That is the whole history of the case, from the beginning to the end. That report I afterwards published, with subsequent additions to it, in the report of the Survey, because I considered it valuable in the mining interests of the country.

By Mr. Dawson:

Q. All you received was $200?—Either $200 or $250, I cannot recollect which. It occurred twelve years ago.

By Mr. Holton:

Q. I would like to ask you for further information with reference to Dr. Rae's remarks on Dr. Bell's map?—This is Dr. Rae's answer to my first letter:—

"4 ADDISON GARDENS, KENSINGTON, 27th June, 1883.

"DEAR SIR,—I beg to acknowledge your favor of the 13th instant, on the subject of a letter of mine on the 'Hudson's Bay route' published in the *Canada Gazette* of the 3rd May. It gives me pleasure to reply to your questions, and make such explanations as appear to me requisite. First, you say I mention 'statements made by Dr. Dawson.' I find that I nowhere mention a Dr. Dawson in my letter, and know well that my friend, Dr. G. M. Dawson, your assistant Director, is incapable of making any such statements as those which I have called in question. The Mr. Dawson I referred to is the M. P. of that name; in fact, the first paragraph in my letter might, I think, have made that point clear, as I specially alluded to the debate in the Dominion Parliament.

"I am glad you sent me copies of the proposed maps of Moose River, in which I put in very roughly, from *memory*, the corrections required.

"There are or were in my day two islands to the N.W. of 'Inner Ship Hole,' called the 'ship sands,' and these islands were separated by a deep and swift stream from the N.W. shore of the river, which occupied about twenty minutes to paddle across in a canoe. Spring tides, aided by a gale of wind, sometimes cover these islands with several feet of water; on one of these occasions a friend and myself nearly lost our lives. We were lying under our canoe, where I have marked X during a pitch dark night, when the tide came upon us; to cross the river to the N.W. shore was impossible, as our frail ship would soon have been swamped, so as the water rose I pushed our canoe over the island to the one nearest the 'Ship Hole,' where some willows, about ten feet high, grew; providentially, my steering was accurate, and no man ever heard a more grateful sound than the scraching of the willows (I *could not see them*) against the bow of our canoe.

"If the Moose River is as your map shows it to be, the X should have been well inland on the main shore of the left bank of the river.

"My first voyage in the Hudson's Company's ships was outward bound in 1833, and our long detention by ice in the Hudson's Strait occurred in July, *certainly*, and probably during the early part of August.

"In the same Autumn (1833), I think in early October, possibly the latter week of September, but I cannot give you the exact date without hunting up old documents in the Hudson's Bay House, both the York Factory and Moose ships were forced to winter in the Bay, the one at Charlton Island, the other at Churchill, there being a compact barrier of ice across the mouth of the Bay.

"My two other voyages were homeward bound, and the passage of the Strait was made in, I think, September, and the first part of October. All I am certain of is that the dates did not run so late as November.

"I ought perhaps to say that it is no business of mine what may be the form of maps published by the Dominion Government, but having been asked, when in Canada, last autumn, my opinion about a contemplated railway to Moose, and being shown a map placing a railway on a strong current river for the distance of a couple of miles, as if it had been dry land, I was bound to tell them the truth; the truth, at least, as it was in my time. These gentlemen told me of other information they had received of less importance, but equally erroneous, which I did not think worthy of notice, but all tending to show the navigation of the bay in a most favorable light.

"Believe me, dear Sir, faithfully yours,

'ALFRED R. C. SELWYN, Esq., LL.D., F.R.S., &c., "JOHN RAE.
"Director of Geological Survey, &c."

The next letter, from Dr. Rae, was as follows:—

"4 ADDISON GARDENS, KENSINGTON, 20th November, 1883.

"DEAR DR. SELWYN,—I have just received your letter of the 7th instant, referring to the north branch of the Moose River. In reply to your kind enquiry, I must say that it is *possible*, by some great convulsion of nature, that the north branch of the river may have ceased to exist, but in the usual course of things such an event was not at all likely. I merely said something on this head to give Dr. Bell a *meagre* chance of being right. You may make this north branch even wider than I showed it on the rough sketch I sent you, unless the ship sands have greatly increased in width. Having traced and mapped by observations with compass, sextant and chronometer, nearly 1,800 miles of Arctic coast and land previously unexplored, I had got into a way of trying to do things accurately, as far as my means would allow, and when I had to meet some of the surveys of the *best* (they were not all *best*) of the Government naval officers, I was about right with them. It is forty, not fifty years since I was at Moose, but it is half a century since I went there first.

"As you are no doubt interested in the Hudson's Bay route between Manitoba and England, I fear that this year's experience of the Hudson's Bay Company's ships will not brighten their prospects. Both ships were a month or more in the ice on their outward voyage, the ice being met in the Bay far to the south.

"The Moose ship got home only a few days ago; the York ship has not yet turned up.

"Believe me, very truly yours,

"ALFRED R. C. SELWYN, Esq., LL.D., F.R.S., &c." "JOHN RAE.

Q. I see here a map "sketched by Mr. C. H. Rockwell, of Tarrytown, N. Y., 1883"?—Yes; the next one is a copy of Dr. Bell's map, and the remarks which appear in red are those of Mr. Parsons. Then the other map is one published in 1774, exactly one hundred years ago, by some explorers. I might also say, that I think a great deal more evidence ought to be brought before the Committee before it closes its labors, because hitherto any witnesses that I have asked to be heard, have not been called, and witnesses only on the opposite side have been heard. However, Dr. Bell has made charges very distinct and definite against me and I have in that matter called attention to his inaccuracy.

By Mr. Dawson:

Q. Is it not your experience, Dr. Selwyn, that, although scientists may have their different views, when they are at home they are always a very happy family?—It does not appear to be so in the Geological Department here. There is no harmony.

By Mr. Holton:

Q. Why is there not harmony?—I cannot tell. I was not aware of anything that should create discord.

By Mr. Dawson:

Q. But we were not aware that these witnesses would give evidence one way or the other. The witnesses which were called were men of such high character and standing; take Dr. Hunt, for instance, a man whose reputation is world-wide, who would suppose that he would take a side?—Everybody would who knows anything about the matter.

Q. And Prof. Chapman?—Prof. Chapman said nothing against the Survey.

By Mr. Holton:

Q. Why does harmony not exist in the Survey?—I was aware that Dr. Bell and Dr. Hunt were both offended with me, and I suspected they had taken steps to make trouble amongst the employés.

Q. Dr. Hunt is not at present a member of the Survey?—He was but not now.

Q. I am speaking of the present interference?—I believe Dr. Bell is always scheming. Sir William Logan himself said so, years ago.

Q. Surely Dr. Bell has not more control than you?—It is not control, but discontented persons can lead young men with them.

Q. You unhesitatingly attribute this discord to Dr. Bell?—I do not know that there is any discord in the Survey.

Q. You have said so?—Between Dr. Bell and myself. There is no discord between myself and Dr. Dawson, Mr. Whiteaves and Mr. Hoffmann; with none of them, in fact, except Mr. Fletcher, which, I think, was due mostly to his small salary. I have the whole correspondence.

Q. You have stated that the whole cause of the discord which exists is attributable to Dr. Bell?—Yes; there is no discord, except between Dr. Bell and myself, that I am aware of.

By Mr. Baker:

Q. Am I right in drawing the conclusion that the report of Mr. Torrance on the phosphate regions is a good and useful report?—I have not carefully looked over the whole of it yet, but from the little I have seen of it, that is my impression.

Q. What led to his dismissal or the discontinuance of his services?—Simply because he was employed temporarily. He was not appointed at all, and the sole reason was, that I considered he was altogether too slow with his work. I said to him, "If you cannot do this work more rapidly, Mr. Torrance, I do not think you will succeed in it, and you had better seek employment elsewhere." If I had any feeling for him, it was one of friendship. I have letters from him thanking me for my kindness in recommending him to people, &c. When he went out to this region, he spent six weeks in cutting a single line of four miles in length, and he also spent twenty days in Montreal getting information from Mr. Vennor, and when I find a man so desultory as that, I say he is not fitted for the work.

Q. This discontinuance of his services then, is more to be attributed to his slowness than any want of ability?—Yes; it was no want of ability.

Q. As regards Dr. Bell's map, of Moose River, is it possible for any surveyor, in so short a time as three days, to delineate upon a map the sinuosities of the coast line and to make it of any practical use?—I certainly think not.

Q. But Dr. Bell informed the Department that this was only a rough sketch, taking from two and a-half to three days, probably?—He did not; he thought it was a survey.

Q. Did he state so?—It is stated so on the map.

Q. Do you think it is possible to make a survey of so large an area in so short a time as three days?—No, I do not but I do not; know how long Dr. Bell was occupied in making it.

Q. Is it usual for the officers of the Geological staff to make what is necessarily conceded to be nautical Surveys?—No. They are instructed to make the best survey they can, but always to state the circumstances under which it is made. All actually measured lines, only, should be drawn in full on the map; all others should be dotted.

Q. This map has really the appearance of a complete map; I mean to say that the shoals are marked as indicative of five-fathom lines, as the outer defining of the shoals, the configuration of the various islands. The whole map seems to impress one with the idea that it has been carefully prepared?—Yes.

Q. Any one taking it up, as I do now, would think it was a carefully prepared map. Did Dr. Bell, in forwarding it to the Department, clearly and distinctly state that this was simply a rough sketch done in his own time, and not forming any part of his duty as a member of the Geological Survey?—No; it is always a part of the duty of a member of Survey where no maps exist, to make them, and where any does exist to improve it, but always to state the circumstances under which it is made.

Q. Is it generally expected that officers of the Geological Survey shall make what cannot be otherwise than a nautical survey?—They are simply supposed to make sketches of the coasts that they traverse, and often, for the sake of making the map more useful, we take information from the marine charts and put it on the maps, always stating that such and such work is adopted from existing charts.

Q. This map of Moose River impresses me with the fact that it is more or less a trigonometrical survey?—Yes; I should think so.

Q. Are officers of the Geological Survey supposed to know all the matters required for the making of a correct trigonometrical survey?—No; but a traverse survey, and a triangulated survey, to some extent.

Q. But the principal points are not checked by a series of back angles, &c.?—In some instances, not all; in fact I consider our surveys generally to be rather sketches than surveys. I have made such myself of the whole of the Saskatchewan River, and which is published in one of our reports.

By Mr. Holton:

Q. Dr. Bell has stated that he handed this map in simply as a sketch, and that he did not want it used?—When I called attention to Dr. Rae's letter, he then wished to withdraw it, but up to that time he had got it engraved and printed, with a view of having it go into the report to illustrate it. I pointed out to him that it had been printed, and that all this expense would be thrown away. I then treated the matter in the manner in which I have done, and the circumstances in connection with which have already been related to the Committee.

ERNEST GAUJOT, Esq., of Bellville, Ont., Mining Engineer and Manager of the Philadelphia and Canada Phosphate Company, was also called and examined.

By the Chairman:

Q. You have devoted a good deal of attention to the iron and gold deposits in the vicinity of North Hastings, Ont?—Yes.

Q. Have you conducted mining operations in either or both of these minerals?—Yes; both.

Q. To what extent?—I may say that I happened to be connected with the Consolidated Gold Mining Company, near Marmora, in Hastings County.

Q. How long ago?—I went there in 1880 and remained until the beginning of 1882.

Q. And what did you accomplish during that time?—When I went there several shafts were sunk to a depth of from 10 to 20 feet. I continued one shaft to a depth of 200 feet, and the others to a depth of about 80 feet.

Q. What was the rock formation, quartz?—No; mica slates, and the outer walls were in the granite formation.

Q. Did you push out any leads or adits?—Yes; some were pushed to a distance of about 70 feet and others to a distance of about 160 to 170 feet.

Q. How many men did you employ?—About 200. Part of that mine had been previously called the Gatling mine and the Tuttle mine.

Q. How long were your operations continued?—Until the beginning of 1882.

Q. With what result?—The result, as far as the vein was concerned, was very good, but when I left the works were not completed. There were several veins, but they were not opened; they had been explored and trial pits sunk, but not opened. There were four pits.

Q. How wide was the vein that you worked?—From 8 to 24 feet.

Q. Was the gold pretty uniformly disseminated through the veins?—The vein matter was mispickel or arsenical pyrites. I never worked on a large scale, but have made a great many assays. It was worth from $6 to $200 a ton.

Q. Did you put up a crushing mill?—I commenced one, but did not finish it.

Q. Is that work now going on?—Yes.

Q. Are there several mines in that vicinity?—Yes; the Feigle and Gladstone Mine were being worked when I worked the Consolidated, and there are also a great many other mines not being worked at present, because they are all waiting to see the success of the Canada Consolidated. I have also visited the mine since, and the vein has improved. It is one of the largest veins I have ever seen, and I think I have seen every mining district in the world. There has been some difficulty in the treatment of this ore. It is very refractory ore to treat, and one process, called the Chlorination process—which, in the United States, proved a success on a large scale—and which seemed, with this ore, to work very well on a small scale, but not on a large scale; however, it seems to work better now.

Q. But they have demonstrated, at least, the existence of large deposits of rich gold-bearing ore?—Yes. The shaft is 210 feet deep now, and the levels are much longer than when I was there, and they have improved both in quantity and quality.

Q. How many men are employed now?—I think about eighty. I extracted a great deal of ore, and they do not need so many men, because they have about 10,000 tons of ore ready for treatment.

Q. How extensive does this gold deposit appear to be; over what extent of country?—About ten miles in length, and I know of four veins within about 80 or 120 feet. The vein is laid out on a geological map, made by Mr. Vennor a few years ago, and which, I believe, is pretty correct. I have seen a good many sulphuret veins, also gold-bearing, in the County of Hastings.

Q. What is your impression as to its proving a source of great wealth or richness hereafter?—I have no doubt at all about it. The only thing, as I said before, is the process, about which there is a little difficulty. I know by experiment with the old amalgam process, that we could treat very successfully and get out about 80 per cent. of the mineral, but with the Chlorination process we have been able to get out 96 per cent. on a small scale. This does not only produce gold, but in roasting we save the arsenious acid, as a bi-product, which is also valuable.

Q. As to the iron deposits, are they in the same locality?—Yes; they commence at Madoc, about ten miles from Marmora, and extend about sixty miles north.

Q. And what is the width of the iron-bearing belts?—The widest is, I should say, about three miles.

Q. What development has there been of these deposits? What works have been carried on?—In many cases shafts have been sunk; I think the deepest is about 80 or 90 feet.

Q. What is the quality of the iron?—Specular, hematite and magnetic.

Q. About what percentage of iron is there in the rock?—I found the average of the hematite about 54 per cent., and the specular or magnetic goes about 63 to 66 and 67 per cent.; in fact, of very good quality.

Q. How much sulphur does it contain?—One belt contains a good deal of sulphur but it is very well defined.

Q. How much titanium?—None, as a rule.

Q. Is the iron industry in that locality being carried on extensively for commercial purposes?—Not at present. With the duty of 75 cents, heavy railroad freights and heavy canal tolls, it is not possible to do much at the present price of iron.

Q. But there is a bonus given by the Government?—That is for home production.

Q. Why should it not be done?—I have tried to show that it could be done. There could be a profit of $4 a ton on pig iron, which, even in good times, would be a large profit, but it has been difficult, so far, to induce men to do it.

Q. Have these iron properties been secured to a great extent by capitalists from abroad?—A good many.

Q. And they have more interest in taking the ore out of the country in a raw state than by putting up smelting works here?—Yes. An impression seemed to prevail in Eastern Pennsylvania, New Jersey and New York, that the importation of foreign ore killed the home mines, but I think that is all bosh, because for every ton of imported ore they can use one ton of their own ore, by combining the two together and each aiding the smelting of the other.

Q. They require rich ores like those of Hastings?—Yes.

Q. How many men do you think are employed up there in the mining industry at present?—At present not more than 200.

Q. From what you say, I should think the supply was almost inexhaustable?—It is; I know of my own personal knowledge of about fifty beds.

Q. And you think they are permanent veins?—Some are. In the hill deposits at Wollaston we have reason to believe it is a permanent vein or belt. They have a shaft of 100 feet and are still working it. With a diamond drill they have proved it to be deeper.

Q. Have these iron deposits been reported upon by the Geological Survey?—Some of them have. The hematite, &c., of the Madoc district have been referred to by Mr. Vennor, Mr. Macfarlane and Dr. Hunt. A great many new beds have been discovered.

Q. How long is it since they have been visited by any member of the Survey?—I came here in 1880, and have not seen them there since. The Americans have a great deal of confidence and have been largely bought up by gentlemen from Cleveland, Cincinnati, Pennsylvania, &c. I have letters asking me to make reports with the view of purchase, and a good many are interested already. Some iron men of Cleveland have lately acquired about 100,000 acres in that vicinity, for the purpose of securing the iron deposits which are believed to exist there. Galena, copper, mica, asbestos and phosphate is also discovered in Hastings County, but not developed.

HOUSE OF COMMONS, OTTAWA, 2nd April, 1884.

The Select Committee on Geological Surveys met this morning, Mr. HALL in the Chair. SCOTT BARLOW, Esq., of Ottawa was called and examined.

By the Chairman:

Q. You are connected with the Geological and Natural History Survey of Canada?—Yes as surveyor, draughtsman and explorer; I am chief draughtsman at present.

Q. How long have you been connected with the Survey?—Since November, 1856.

Q. Your father was connected with it before you?—Some few months, I think; in June of that year.

Q. You knew the late Sir William Logan?—Yes, and since I joined the Survey I have been with him in the working of his field notes and everything in that connection.

Q. There has been some discussion before the Committee in reference to the work done by Sir William Logan, during the last years of his life, in the Eastern Townships, It is said to have been represented by a certain map. Would you give us the history of that work and the map itself?—That is the map of the Eastern Townships as we called it. Sir William had been working on that for several years. When my father and myself came on the Survey a good many geological facts had been placed on other maps on a smaller scale, but inaccurate and imperfect in many places. Sir William discovered that he could not put his geology upon it properly, and my father being a draughtsman, was asked about it. My father said he could compile one from the material in the Crown lands Department; that was the topographical part of it, which was what Sir William chiefly wanted. Sir William said inaccurate topography created a wrong idea. I think we went to Toronto—the seat of Government was there—and copied the plans of the Townships and also got some other information; we also utilized the railway surveys. I also deduced some facts from the map of the British American Land Company, which, I think, was prepared by Mr. Wells, and we got maps of the International Boundary, on the 45th line, made by the Commission, and also the Boundary Survey between New Brunswick and Canada, and the Admiralty charts. A good deal of work was also done by various members of the staff, in the several townships, pacing here and there many thousands of miles, taking roads chiefly, and anything in connection with mines or escarpments where rocks were exposed. These roads were placed upon the map and, of course, having the township lines tolerably correct, when they were fitted in through my father's skill, we made a very good map of it. I assisted him, as Sir William Logan states, in the atlas, which came out in the large report in 1863.

Q. What connection did Sir William Logan have with that map?—Sir William's work was, of course, geological.

Q. Did you hand it over to him?—No; it was there for his use, but the material being deficient in some parts, it was kept unpublished. The geological part, in most of the areas, was ready to be placed on it from other maps and sketches, so that Sir William was waiting for the map to be finished.

Q. His part of the work was done and ready to be placed on the map when it was finished?—Yes; the portion on the north of the St. Lawrence was not complete, and Mr. Webster was sent out to complete it, by pacing a number of roads, so that it would be ready for publication in 1872. (The survey was commenced when Sir William Logan was Director.) Dr. Selwyn refers to it in the report for 1872, I think, and promises it the next year. It would have been ready that year, but my father was taken away from it to other work wanted by Dr. Selwyn and, of course, he had to lay it aside. Some time after Dr. Selwyn was appointed Director-in-Chief. Sir William would frequently come to the Survey to see my father. He would generally drop in of a morning, and would say, "Well, Mr. Barlow, how are you getting along with the Eastern Townships map?" to which my father would have to reply, "Oh, I am doing something else, Sir William." He would then say, "How is this; I am afraid, Mr. Barlow, that I will be dead before this map is finished;" to which my father would again reply, "I cannot help it, Sir William; I am placed at other work; I would like to finish it." Sir William often repeated this, in his anxiety to get that map out, until he left for England, finally.

Q. Do you think it was his wish, up to the time he left the country, that that map should be published?—So far as I know; everything he said gave me that idea. He had no doubt about the correctness of his theories, and he wished to publish it to the world to show that he was right; at least that is my opinion. My experience of him was, that he was not a man to arrive hastily at any conclusion; he was a very just man.

Q. That map has never been published as a geological map, has it?—Not as a geological map, although on three of the sheets geological lines were placed and were engraved in London. I myself put on many of the lines preparatory to it being engraved, having Mr. Richardson to help me in getting the geological lines in, and Sir William put on many of them himself, and one or two copies, I believe, he colored himself with his own hand.

Q. Are these still in existence?—They have been so mixed up that I cannot tell where those colored by Sir William are.

Q. They were left in charge of the Survey when Sir William resigned his connection with it, were they not?—A number of them were, but some I lost track of. I do not know whether Sir William took them to England or not.

Q. Have you ever seen any in the Survey since his death?—I have not seen the ones that he colored with his own hand. Some were colored by his instructions and some by Dr. Selwyn's.

Q. In what form has the map been published?—It has been published as a topographical map, by Walker & Miles, Toronto, and last year by Dawson Bros., Montreal.

By Mr. Holton

Q. I understand you are chief draughtsman of the Survey?—Yes.

Q. As such, I suppose you have duties in connection with the preparation of maps which are published in connection with the reports?—For two or three years or more nearly all the connection I have had with them is to give them the framework or foundation. I give the geologists the foundation or projection, and they work in the geological information themselves.

Q. Can you explain why it was that the map in connection with Mr. Fletcher's work in Nova Scotia and Cape Breton, in 1877, has never been completed or published?—I think the reason was not on Mr. Fletcher's account, for I believe he had it ready. The only difficulty, in my mind, was that the engravers or lithographers were not ready, but I think it could have been got ready.

Q. Who is responsible for this delay?—Dr. Selwyn has the whole control of the work. When maps are returned by them, I am asked to approve them, and I generally do, because it makes no difference.

Q. And you feel inclined to blame the lithographers and engravers?—I think that if the lithographers and engravers had been posted they could have done the work. I do not know whether it was Dr. Selwyn's duty to post them or not, but I suppose it was. Perhaps he did post them, to the best of his ability, but I am confident that I could have had those maps done if I had had to do with it.

Q. Would the same remarks apply to the maps which were prepared and intended to accompany the reports of last year?—Yes; they could easily have been prepared.

Q. Were all the maps published in the last volume with Mr. Ells' report, which should have accompanied it?—As near as I can remember, I think all the maps that could be conveniently got ready were published with Mr. Ells' report, and I am not aware that Mr. Ells wished any more published at that time.

Q. Are you a practical field geologist?—I have had a good deal of work to do in the field.

Q. In connection with the Survey?—Yes.

Q. In what direction?—During the first year of my service I was down on the south shore of the St. Lawrence with the late Mr. James Richardson, in 1857.

Q. Were you not subsequently employed in the Springhill coal field in Nova Scotia?—Yes; that was in 1870.

Q. Did you prepare a report of your work in that section?—I made summary reports, but I have never been able to make a detailed report of my work in the field. It has been in connection with coal fields, and a very dificult field to work, and the amount of money at my disposal was very small, so that it did not give me a fair chance. I complained to Sir William Logan, in 1871 or 1872, and told him I was disgusted with the slow progress I was making. My work was in connection with a coal field, and he being very much acquainted with the Welsh coal fields, complimented me and said that a coal field was not worked up in a day, and for me not to be too anxious as he had no doubt I would make a good job of it. "Do not be too anxious," said he, "it is the work of years."

Q. Was this summary report intended for publication?—Yes; as it would satisfy the country that there was something being done of use to miners.

Q. Why was it never published?—I was removed from the field in 1878; I never got enough money, but had to do the digging and boring by hand, and consequently, Dr. Selwyn withdrew me from the field.

Q. After how many years' work was it that you were withdrawn?—I dare say, six or seven years.

Q. Was the result of your six or seven years' labor lost?—No; it will be of use yet, and will be worked yet.

Q. But has not been utilized so far?—Not very much; of course, in connection with the coal seams, it has been utilized, but the topographical map of the county of Cumberland has never been published, and cannot be published until some further topographical surveys and geological examinations are made.

By the Chairman:

Q. The expenditure for the Survey has now reached, approximately, a sum of about $90,000 per annum, a very much larger sum than was formerly given to it, during Sir Wm. Logan's administration, and greatly in excess of the amount assigned to Sir William Logan. Will you give to the Committee your opinion as to the practical efficiency of the Survey, as compared with its expenditure. Is it, in your opinion, producing results proportionate to that expenditure?—Well, I can hardly answer that. It sometimes seems to me that it is not producing results in proportion to the expenditure, in comparison with what was done in Sir William Logan's time. Perhaps I am prejudiced, but I think that the small sum, that was granted under Sir William Logan's rule, resulted, in proportion, in a great deal more work being done. There does not seem to be now the same combination as there was then; every man almost, seems to take his own way of doing his work handed over to him to do. They are told: "There is your field, work it up," and a few general instructions are given, which may be utilized or not.

Q. Do you not think there is unnecessary or unfortunate delays in giving to the public the result of the work of the Survey, year by year?—It seems very slow in some cases.

Q. For instance, these maps that are published in connection with this last report of 1880-81-82 This report was published in 1883 and only furnished to the public within the last few weeks, and contains the maps—first, to illustrate Dr. Bell's reports of 1875, 1877 and 1881, and all the geological maps of eastern and northern New Brunswick, to illustrate Mr. Ells' work in that district, which was performed in 1881-82. Does it not seem possible and practicable to give to the public, in the form of these maps, the result of that work without waiting so many years for it. If the work is important, is it not equally important that the public should get the benefit of it before all interest in the locality has disappeared?—Sometimes the trouble is that the whole area has not been examined, and to publish a map of part of the exploration would be of no value, and I think that has been the trouble with Mr. Ells' maps, which could not be got ready for a number of years. Hence, the reports were also a puzzle without the maps.

Q. It is very necessary that these maps should be published along with the report?—Yes: to give the people a general idea of the work, but to publish a map for every season's work is utterly impossible. With the limited area that is examined it would cost too much, and so they generally wait until a section is finished and then publish it. Of course if a portion can be cut off, it is published, but it all depends with the Director, if he sees fit or thinks it necessary to do it.

Q. Is there not some method of publishing preliminery maps, called, I believe, index maps?—Occasionally that is done, and perhaps it might be done more than it is. It would give an idea of the work until a more detailed map could be got ready.

Q. It would help to illustrate the report, at least?—Yes; and they could be run up in a short time.

Q. Do you think it would be of advantage to the public if more attention were paid by the Survey to our mineral deposits and mining industries?—Yes.

Q. Could not this work be done without much additional expense, by utilizing the time of the present staff?—Some years ago there was a collection of mineral sta-

tistics made, but I think it was dropped, chiefly through the dislike which mining owners and managers had of making their results known. In my own case, they refused to give information by letter, but had there been properly appointed officers (who were competent men) they could have gone round and collected the statistics without much additional expense. It would only require the salary and expenses of a competent mining engineer. It requires a personal visit to the owners and managers of mines to overcome their dislike. They are afraid of the public knowing too much about their business, and a competent mining engineer could show them that it was to their interest and benefit, and that he will not publish more than is necessary, and will not publish anything in connection with their private business. But the matter lapsed, and little odds and ends may have been collected, but were not embodied in the reports. Mr. Hoffmann, I believe, has a great deal of mining information, which he will give to those who visit him.

By Mr. Lister:

Q. Do I undeastand you to say that the work done in recent years is not in proportion to the work done by Sir William Logan?—Yes.

Q. What territory did Sir William Logan cover? As a fact, were not his surveys confined to the old Provinces of Upper and Lower Canada?—Chiefly from Gaspé to Lake Superior.

Q. But under Dr. Selwyn's administration, or since Sir William's resignation, the work has been extended to the North-West Territories, British Columbia, and the Lower or Maritime Provinces?—Yes.

Q. In view of that fact, how does it now compare with what it was in Sir William Logan's time?—It is a great deal more.

Q. It may be more in dollars and cents, but in view of the fact that the territory is much increased?—It seems to me that what was done then was better and more effectually done.

Q. Was it not easier to make surveys within the boundaries that then existed, or in other words, has it increased the cost very materially on account of the distance from the base of operations, from British Columbia to Cape Breton?—Yes.

Q. Still, in your opinion, the cost is much greater in proportion to the work done than it was then?—It seems to me so.

Q. Have you ever calculated, or is it merely a rough guess?—Occasionally I have calculated. I am not making any positive statement, but just an approximate estimate. It is not a close calculation; I do not feel very much interested in the matter, it not being in my department.

By Mr. Wood:

Q. Do you know whether Sir William Logan supplemented what he got from the Department from private means of his own?—Occasionally he did. I know I told him that all the salaries were too small, and he said that was the case, but in better times he hoped to increase them.

By Mr. Lister:

Q. I suppose that the work, since Sir William Logan's resignation, has consisted more of work which has been carried on in the outlying Provinces, rather than in the old Provinces?—Yes.

By Mr. Holton:

Q. Have you done anything of importance since Confederation in the old Province of Canada?—Sir William worked there.

Q. Since Confederation in 1867?—Sir William was constantly working in the Eastern Townships, when he had time; that was the chief work that was done in the older Provinces. I do not remember much that has been done since Confederation, except in the Eastern Townships.

GEORGE CHRISTIAN HOFFMANN, Esq., of Ottawa, was next called and examined.

By the Chairman:

Q. How long have you been connected with the Geological Survey of Canada?—Since September, 1872.

Q. You are one of the Assistant Directors?—Yes.

Q. What was your previous scientific training and experience?—I have been following chemistry for about thirty years. I was brought up to chemistry and metallurgy in the Royal School of Mines in England and in the Royal College of Chemistry.

Q. Had you any practical experience in Geological work before coming here?—No; I confined myself almost exclusively to chemistry and metallurgy.

Q. Will you explain to the Committee what is your occupation now in that capacity?—To examine all the ores and minerals which may be brought to the Survey, and to make analyses of all descriptions, and to receive visitors who have any minerals for identification and to give them information in regard to their probable economic value; and also, in case of their asking after certain minerals, to tell them where such they may be had.

Q. Your analyses, then, are not limited to specimens that are furnished by the Geological staff?—By no means. I should add that last year, four or five months out of the year were spent in making single determinations of iron or copper, or work of such a nature—what you would call fragmentary work to outside visitors—and also assays of gold and silver.

Q. Is this work done gratuitously for the public?—Yes.

Q. And in what form is the information conveyed to them?—Either personally or by letter.

Q. Is a certificate or report furnished?—The certificate is in the form of a letter. Very often a great deal of this work cannot be formulated into a report, and it is therefore not know to the public at large. When it is of value to the public generally, it is published in my reports.

Q. You keep a record of all the analyses made?—Yes. I ought perhaps to mention that, in addition to the duties I have already mentioned, I also make analyses for all the departments.

Q. Although you have no direct personal connection with the geological branch of the Survey, still your long residence there and connection with it, have given you opportunities for judging as to its methods and efficiency?—Hardly; because my attention is so much engrossed with my own work, too much so, at any rate, to pay much attention to any of the work of the Survey, outside of my own branch.

Q. Then you would hardly feel competent to express an opinion as to the general efficiency of the Survey?—I hardly think it would have much value.

By. Mr. Holton:

Q You stated that your position on the staff was that of Assistant Director?—Yes.

Q Have you any other title?—Chemist and Mineralogist.

Have you not been called Inspector of Mines?—That was gratuitously given to me by outsiders, but I never made the slightest pretension to it.

Q. Has that not appeared in connection with your work?—No; not at any time. The only place where it was pointed out to me was in Starke's Almanac.

Q. So that is a title you disclaim?—Yes.

Q. Have you ever had any practical mining experience?—I was connected with iron works in South Wales as an amateur. I have gone over the works in company with the Superintendent, but that would hardly justify me in claiming any experience.

Q. You have had no technical training as a Mining Engineer?—No.

Q Have you ever entertained or expressed an opinion as to the value of the collection and preservation of mineral statistics?—I think they are very difficult to obtain, and unless every reliance can be placed on them they would be worse than useless. People are adverse to giving information which is intended for publication. You would not like to have the Manager of a Company, in which you were interested, giving information adverse to the mine, which he, perhaps, would have to do if he told the truth, and that is where the difficulty comes in.

Q Are you not aware that the work of gathering and preserving such statistics is undertaken and performed by the Geological Surveys of other countries, in the

United States, for example?—Yes; I am aware of that. They are armed with exceptional powers, and after all it may be open to question how far the returns are what they ought to be. A person can make a return and tell you the truth, but he can also tell you half the truth, and therein lies the difficulty of getting absolutely accurate and true statements.

Q. Am I to understand that it is because of the difficulty of obtaining accurate statements that you consider it inadvisable for this Survey to undertake such work? Scarcely in that light. That is a difficulty which I see in procuring statistics. Of —course correct statistics would be valuable if they could be obtained. There is no question as to their value. It was started in our Survey when Mr. Robb undertook the collection of statistics, and he met with very great difficulties.

Q. I have been told that at one time you suggested the revival of that system in our Survey?—I think always the best information is given. The officers and field men wind up their reports with the names of economic minerals, as a rule, and in my own report I give the localities where the minerals occur, but when it comes to returns, that is where the difficulty comes in.

Q. Did you ever in any report, or otherwise suggest to your chief or the Government, the advisability of collecting mineral statistics?—No, I think Dr. Selwyn is fully alive to their importance. I always collect the information as it is brought to me.

By the Chairman:

Q. You say you were brought up in the School of Mines in England. Would you furnish the Committee with some information as to the constitution and functions of that School?—It was for the training of men in all the various branches of science relating to mines.

Q. Are its functions limited to theoretical teaching?—Yes. Of course a man could have an opportunity of visiting mines in England. There are so many that he has no difficulty in obtaining practical information during the recess.

Q. I had an impression that it interested itself in the collection of mineral statistics?—Dr. Robert Hunt, who was connected with it did that.

Q. But was the work of the School limited to teaching?—He was a professor of the Institution, but he was an officer of the Government apart from that.

Q. Was it as Professor of the School of Mines, or as being connected with the School of Mines that he collected these statistics?—No, that was a specialty.

Q. How did he obtain these statistics?—I am hardly competent to make any statements in regard to that.

Q. They are very complete and accurate, are they not?—I could not say. I do not think they were ever obtained by personal visits on his part. I think the collection was made entirely by provincial officers. It was known that he was the person who collected these statistics, and the information was sent to him by the provincial officers. In addition to the duties which are entrusted to me, which I have mentioned, I may add that I also act as Curator to the mineralogical section, and am superintendent, under Dr. Selwyn, of the arrangement and labelling of the specimens.

Q. And what portion of your time do you think is devoted to that?—It depends on circumstances. I always go round every day, and then I devote a portion of my evenings to manuscript work in connection with it.

By Mr. Lister:

Q. I understand you to say that Dr. Selwyn was always fully alive to the importance of collecting this mining information?—That has always been my impression.

Q. Have you recently recommended that that should be done?—I had no occasion to recommend anything; such was Dr. Selwyn's desire. I always accepted it as a fact that it was his wish.

Q. Have you expressed yourself in favor of that being done?—I should always do so.

Q. But have you done so within the last few months?—I do not remember having done so recently.

Q. But you are in favor of it being done?—Provided accurate information can be procured.

Q. But you say it cannot be done?—Not accurately.

Q. Then you are not in favor of it. The interests of the miners would prevent you getting accurate information?—Such is my impression.

Q. Then you consider the attempt would be fruitless?—Yes; I consider it would be abortive. I think it appeals to everybody's reason that those who have mines which do not turn out well will not give information to that effect, as they will then lose their chance of getting what they paid for it. These are mostly matters of speculation.

By the Chairman:

Q. You are assuming, of course, that the mines are all unproductive, and that they are being carried on for the purpose of inviting the public to invest in their capital, but I suppose some of the mines are profitable?—Yes.

Q. There would be no objection to their giving information about those mines?—No; but they would only form a few of the whole.

Q. But would it not be in the interest of the public at large?—It would, but not to the individual, and the individual could not afford it.

Q. Have not these objections existed in other countries where these statistics are collected?—I could hardly say. Then the question arises as to how far these statements are accurate. They may be misleading.

Q. You do not know that they are?—No.

Q. But they are received as accurate?—Yes; and therefore might create the greater amount of trouble.

By Mr. Holton:

Q. Are you aware as to how these mineral statistics are collected in the United States?—No; I am not competent to give an opinion upon that point.

Q. What system is adopted in England?—They are generally furnished to the Inspector of Mines by Prof. Smyth, who has charge of one of the most important mining sections in England, the Duchy of Cornwall, and who was a member of the School of Mines.

By Mr. Lister:

Q. Do you know whether Dr. Selwyn has ever recommended that proper steps should be taken for the collection of these statistics?—I think Dr. Selwyn has given his attention to the collection of statistics.

Q. But you are not aware that he has ever recommended it?—No.

Q. Although you say for years he has been alive to its importance?—Dr. Selwyn has always impressed upon me the importance of making notes of the information brought to me by visitors in connection with mines and minerals.

Q. Do you know whether any investigation has been made as to how these statistics are collected in other countries?—I do not.

Q. You do not know whether any steps have been taken to ascertain that?—I am not aware.

JOSEPH F. WHITEAVES, Esq., of Ottawa, was called and examined.

By the Chairman:

Q. How long have you been connected with the Geological Survey of Canada?—I was appointed palaeontologist to the Survey in 1876, and assistant director the year after, but was first requested to join the Survey by my predecessor, Mr. Billings, in 1874. He asked me then to undertake a large section of his work,

and after seeing Dr. Selwyn I agreed to this, so that I was assisting Mr. Billings for two years before receiving a permanent official appointment upon the staff. For the last two years of his life the late Mr. Billings was in such a poor state of health that most of the work of the office, as regards palaeontology, was done by myself. In Sir William Logan's time I had worked occasionally, in an informal way, for the Survey by revising the list of post-pliocene fossils in the "Geology of Canada" for 1863, and by examining and reporting upon zoological collections made by various members of the staff.

Q. What had been your previous scientific training and experience?—I am a native of the City of Oxford, in England, and attended the Professor of Geology's indoor and outdoor classes at that University, and have worked at the palaeontology of the district and published the results in the report of the British Association for 1860, and in the "Annals of Natural History" for 1861. Was elected an honorary member of the Ashmolean Society of Oxford, in 1857, for a zoological contribution to its transactions, and a Fellow of the Geological Society of London in 1859.

Q. Your experience in this country is limited to your connection with the Survey?—By no means. I had been Curator and Recording Secretary of the Natural History Society of Montreal, for twelve or thirteen years before joining the Survey, have conducted five deep-sea dredging expeditions in the Gulf of St. Lawrence, two at my own expense, and three on behalf of the Department of Marine and Fisheries, and have devoted my whole life since 1861 to the study of the Zoology and Palaeontology of this country.

Q. Your work is almost exclusively in the Geological Museum here, I suppose? You do not do much field work?—Not now, as it is my chief business to examine all the collections of fossils that are brought in, to name and report upon these, to describe new species, and to identify the horizon of rocks from collections brought in by the explorers in the field.

Q. Do you keep a regular record of your work?—A record is kept of all specimens received and of collections distributed, and a summary of the work done in our department is annually made. It may here be stated that since May, 1883, about 325 pages octavo of biological and palæontological reports, illustrated by 23 octavo lithographic plates, have been issued by the Survey, in addition to the last Report of Progress. The publications referred to are as follows, a copy of each of which was laid upon the table:

Catalogue of Canadian Plants. Part 1. By Prof. J. Macoun .....192 pages.
Contributions to the Micro-Palæontology of the Cambro-Silurian Rocks of Canada. By A. H. Foord.....26 pages and 7 plates.
Palæozoic Fossils. Vol. 3, Part 1. By J F. Whiteaves.....43 pages and 8 plates.
Mesozoic Fossils Vol. 1, Part 3 (Sheets 1–4, of 16 pages each.) By J. F. Whiteaves....64 pages and 8 plates.

Q. Do these reports form any portion of the annual printed volume of the Survey?—Most of our reports, so far, have been printed as separate memoirs. It sometimes happens, however, that I contribute notes to reports in the shape of lists of fossils.

Q. The last published volume of reports does not contain any of your work in the form of reports?—Not more than indirectly, I had something to do with the publication of that report, such as proof-reading, &c. I have each year to write an account of the work done in our Department, for the Minister of the Interior, for publication in the Departmental Report.

Q. You are not a geologist, in the ordinary acceptation of that term?—It is impossible to be a good palaeontologist without having a sound practical knowledge of geology.

Q. What is your opinion as to the practical efficiency of the Survey, and its system and administration, as at present conducted?—I think the Survey is in a very

high state of efficiency, so far as I can judge, as high as it has ever been. That, however, is only my private opinion.

Q *Looking at it from the public standpoint or view, do you not think it would be more efficient if more attention were paid to the mineralogical interests of the country, and that, besides the reports which have been published of the geological work done in the field, reports were also published of our mineral resources and mining industries?*—I scarcely think that any opinion I might express upon that subject, as coming from a pers n who has devoted himself almost exclusively to sciences of a different nature, would be of much value.

Q. Then you do not feel prepared to give an opinion upon these points?—I have no doubt, speaking in a general way, that it would be of advantage to get as much information together as possible, of a practical or economic nature, but am not prepared to express a very decided opinion upon that point, because I have not followed, as closely as I might have done, the exact course which the Survey has taken in that direction.

By Mr. Holton:

Q. Is any time devoted by the members of your staff to the training of young men for the work of the Survey?—To a certain extent. For instance, young men come into my department; they work under me and gain all the information I can give them. It is also my duty to give all the information I can to the general public.

Q. How are the other departments of the Survey in that sense?—The men who enter the Survey in the other departments become assistants first, after which they learn what they can in the field or laboratory, are then promoted, and so on.

Q The Survey is in no sense a training school?—In one sense it is. We do not do here what is done in Jermyn St. in the School of Mines—that is give lectures, &c.—but in another sense it certainly is an educational institution, as we endeavor to exhibit in the Museum as large a number of named species as possible in the departments of palæontology, zoology, botany and archaeology.

Q. Have you any opinion as to the desirability of the training of young men in scientific pursuits being undertaken by the Survey?—It seems to me that this is already done by the Universities up to a certain point.

Q. Is it your opinion that that work is done effectively by our Science Schools?—I think our Universities are doing the work as effectively as can be expected under the circumstances. The President of Columbia College says the very best scientific education a man can have is direct contact with nature itself.

Q. Is it your opinion that a young man can secure in Canada a thorough scientific training, such a training as would be necessary to fit him for scientific work here?—I should think sufficiently so, to fit him for work here or anywhere. For example, my predecessor, Mr. Billings, was originally a lawyer, but he was almost entirely a self-taught man, and was one of the best authorities on the fossils of the Silurian and Devonian rocks in the world.

Q. Is it your opinion that with such a training as you think can be obtained in this country, Canadians are the best men for the work of this Survey?—Most decidedly, other things being equal.

JOHN MARSHALL, Esq. of OTTAWA, was next called and examined.

By the Chairman:

Q. You are connected with the Geological Survey as book-keeper and accountant?—Yes.

Q. How long have you been connected with the Survey?—Since the 4th March, 1872, in conjunction with Mr. Grant, now executor of Sir William Logan's estate.

Both of us were connected with the settlement of the estate Sir William Logan as well as with the Geological Survey.

Q. You have no other duties besides those of book-keeper and accountant, I suppose?—None, with the exception of looking after the correspondence, which I do as well.

Q. Do these duties occupy your time pretty fully?—They more than fully occupy my time, taking into consideration the regular hours of the Survey.

Q. What are the regular hours of the Survey?—From 9.30 to 4 o'clock, but I am generaly there until 5 and 6 o'clock, and sometimes untill 11 o'clock at night.

Q. Discharging these duties solely I suppose you would hardly feel competent to express an opinion as to the general efficiency of the Survey in reference to its Geological work?—Nothing but an individual opinion. I think it is as efficient, if not more so, to day, than it ever was.

Q. Efficient in the sense of giving information in which the public has benefitted, or in adding to scientific geological knowledge?—In both.

Q. In what respect has it added useful, practical knowledge for the benefit of the public during the last three years, say?—Partially in the extension of the Museum, which is better than ever it was, and information given by the management of the survey to the public.

Q. By means of the reports published?—Both by means of the reports and orally.

Q. Are there many applications for imformation by individuals to the Survey?—Yes, quite a number. The year that Dr. Selwyn was here looking after the removal of the Survey to Ottawa, in 1881, his time was very much taken up with giving information to the people who came for it. We arrived here in May 1881.

Q. When Dr. Selwyn is absent are these enquiries made of other members of the staff?—Yes.

Q. What do you think is the average weekly or monthly applications of that nature?—I could hardly say By refering to the letters I could of course tell the number of written applications.

Q. You could give the Committee some approximate idea, I suppose. Are there 500 applications a month or 50?—I could not say just now.

Q. You could say whether there were nearer 50 than 500?—There would be nearer 500 than 50. Probably, on an average of 150 to 200 a month. Still I would not be positive as to the exact number.

By Mr. Holton:

Q. Have you had a scientific education?—No.

Q. In what capacity and at what salary was it that you were engaged?—The Survey paid a slight portion of my salary. I was assistant to Mr. G. R. Grant who was then secretary and accountant.

Q. At what salary?—My salary from the Government was only $100 a year.

Q. What were your duties as such assistant?—To help Mr. Grant to look after the accounts and correspondence.

Q. When was your salary first increased, and to what was it increased?—It was increased in 1877 or 1878, when I had something like $400 from the Government, to, I think, $900.

Q. And at present what is your salary?—$1,400.

By the Chairman:

Q. What is your age?—I am twenty-seven years of age.

Q. You were very young then when you first became connected with the Survey?—I was fifteen years of age.

By Mr. Holton:

Q. Do you receive any pecuniary advantage, either directly or indirectly, in addition to that salary?—No.

Q. Have you ever had any correspondence or discussion with the Auditor-General's office about the accounts of the Survey?—Yes.

Q. What was it about?—About the vote of the Survey and other items relating to it. If I required information I would ask the Auditor-General.

Q. I suppose your accounts are audited?—Yes.

Q. On these occasions have you had any difficulties or discussions as to the appropriations charged, &c.?—None whatever.

By the Chairman:

Q. There was no criticism on the part of the Auditor-General as to the charges made, was there?—There was a criticism about the removal of the Survey from Montreal to Ottawa—a criticism as to the legality of making charges against the appropriation of the Survey.

By Mr. Holton:

Q. But the expenses of field parties have never been discussed or alluded to?—Not that I am aware of.

By the Chairman:

Q. Was all the appropriation for the last year used?—Yes, and more; it was exceeded by $89 and some cents. I might explain that the over-draft of the appropriation was caused by the account from the Queen's Printer not having come into the office until some time in August, and it would be almost impossible to provide for it out of the limited amount at Dr. Selwyn's disposal, on the 30th of June, at the end of the fiscal year.

Dr. A. R. C. SELWYN, the Director of the Survey, who was present, exhibited to the Committee a medal which he had to-day received from the Royal Society of New South Wales, and which was accompanied by the following letter:—

"MOSS VALE, NEW SOUTH WALES, 25th February, 1884.

"MY DEAR SELWYN,—You will probably have almost forgotten, by this time, as it is now nearly six years since we met at the Paris Exhibition and Geological Congress, and we have had no communication since.

"But I have the pleasure to inform you, that as a slight recognition of your services to geology, and especially that of Victoria, the Clarke Memorial Medal has been awarded by the Royal Society of New South Wales; as honorary Secretary it is my pleasing duty to forward it to you and to inform you of the award, but as I am away from Sydney for a change, I am unable to send you the official notification, but will forward it on my return. This note is merely to let you know that the medal will be posted to you by this mail, as the United States postal people make a fuss about forwarding such things. I hope you will not mind making enquiries in case it does not turn up with this. I had a good deal of trouble to get Dana's taken.

"I hope that you are quite well, and that I shall have the pleasure to meet you again before long. It is not easy for me to get leave, but if possible I want to run home next year, and shall, perhaps, take the American route.

"With kind regards and best wishes,

"Yours very truly,

"A. LIVERSIDGE."

HOUSE OF COMMONS, OTTAWA, 3rd April 1884.

The Select Committee on Geological Surveys met this morning, Mr. HALL in the chair. CHARLES J. PUSEY, Esq., of New York, was called and examined.

By the Chairman:

Q. You are interested in the mining district of Hastings; are you not?—Yes; in the County of Hastings, and also Haliburton, Ontario.

Q. How long have you been connected with them?—Since 1878.

Q. What were your previous connections with mining matters and where?—I had been connected with iron works in Pottsville, Pennsylvania, principally.

Q. And were you attracted to Canada by reason of this iron deposit in the vicinity of Hastings?—Yes.

Q. Do you represent a company, or is it an individual investment?—I went there first individually, and afterwards organized a company.

Q. In what way did you learn that there were such deposits?—I learned of them first by parties bringing properties in the the Madoc and Snowdon districts to my notice, and I looked the matter up in the Geological Reports of Sir William Logan and then I came to Ottawa and personally examined the district surrounding Ottawa, and in the rear of Kingston, and the Madoc and Snowdon districts.

Q. Will you give the Committee some idea as to the extent and value of these mineral deposits, over what section of country do they extend, and how rich are the ores?—I found that these ranges of ores extended through from Ottawa westward, as far as we examined, to the township of Snowdon, County of Haliburton.

Q. And how many miles would that be?—About 150 miles.

Q. And what parallel do these veins occupy?—They are not continuous veins, but there are various deposits within the ranges. The widest which we found was in the Madoc district, from Madoc to Bancroft, a distance of 50 miles, and narrower at Ottawa and Snowdon.

Q. You are referring now to the iron deposits?—Yes. This refers to the iron deposits only.

Q. What is your opinion, from the investigations you have made, as to the extent of these deposits within these regions?—I think there are some very large deposits—a great many of them.

Q. What quality of ore is it?—Generally magnetic.

Q. Is it an ore that is easily worked?—It is.

Q. About what average of purity or percentage of magnetic ore is there in the ordinary samples you have taken out?—It varies very much. In answer to that I would refer you to a statement which I prepared and submitted to the Crown Land Department of Ontario, giving a statement as to the ores that I had examined and analyzed up to that time. It is to be found in the Sessional Papers of the Province of Ontario for 1883. My communication was dated Madoc, Ontario, 18th December, 1882, and the following are extracts from it:—

"From the developments already made we find two distinct ranges or belts of iron ore, known, in our explorations as the north and south ranges; what is known as the south range of the district has been traced as far east as the Ottawa River, and in which some very large mines are being developed in the townships reached by the Ontario Central and Kingston and Pembroke Railways. A few miles to the north of this range is the north range or belt, which we have explored for a distance of fifty miles eastward from the township of Snowdon, through Glamorgan, Monmouth, Cardiff, Faraday and Dungannon. The character of the ore in each end of the territory explored, as well as at many intermediate points, is of precisely the same character, showing a fine crystaline structure, with scarcely any variation on the percentage of metallic ore.

"The results of these explorations I deem of very great importance, having demonstrated the existence of two distinct ranges or belts of iron ore, extending from the Ottawa River, in a general south-west direction, through the Province of Ontario. And from the experiments made, there is no doubt but that in these two ranges there exists a great many very large and valuable deposits of iron ore, almost all of which are of great value, on account of the absence of phosphorus.

"I append a statement, showing analysis of ore from most of the deposits now being worked, or which are known to be workable deposits, in order to show the value of the Canadian ores generally, as compared with ores from the various districts in the United States and from foreign countries, upon which the Bessemer works are obliged to rely for their supply of ores.

"I find, on a careful comparison with other districts, that the Canadian ores are generally much richer in metallic iron, and are without a rival in any other country, so far as freedom from phosphorus and other deleterious substances in objectionable quantities, is concerned.

"The development of mines in the various districts in the Province may seem to those who are not accustomed to the difficulties to be encountered, to have been very slow, but I find upon an examination of the official records, that in 1879 the entire shipment was only 2,699 tons, with a steady increase ever since, until the present year they are 51,758 tons, a much larger increase, and under greater difficulties than were experienced in opening up the Lake Superior mines in the United States."

Q. Will you state to the Committee what you have done in the way of developing the iron mines in those regions?—We have explored a great many in the Madoc district; we operated the Seymour mine very extensively and shipped between 15,000 and 20,000 tons of ore. We went down to a depth of about 110 feet, and operated along a vein of about 150 feet; we found, on an average, a regular vein of about 26 feet.

Q. And was it of equal breadth and richness at the bottom where you left it?—No; at the bottom we ran into a fault, where the vein was pinched to a width of 16 feet, but we demonstrated, at another opening, that the same vein continued on down to the depth of at least 40 feet lower than the inside workings. We also developed what is called the Brook mine, in the northern part of Hastings.

Q. How extensively?—We found that the vein became so sulphery that we did not continue to work it. We developed a great many properties, but only shipped from these two that I have mentioned.

Q. What do you do with the ore that is shipped from that region?—A great deal of it is shipped to the Cambria works, at Johnstown, in the United States.

Q. Do you find these ores richer than those in the United States? Are they valuable as a flux in reducing other ores?—As a rule they are richer than the ores of the United States; they are probably not to be compared to the Lake Superior mine, as regards richness, but they are better as regards purity.

Q. Do you work them themselves, or in conjunction with other ores?—In conjunction with other ores. We operated in the Snowdon district, what was called the Victoria mine and the Howland mine, both magnetic ore, and in that district we have a very large deposit of brown hematite, about the only one we have found in the country. We have not shipped much ore from there on account of the difficulty of communication, the railway being five or six miles off. We developed that range with a view of getting a railway through there. I may say that we have not demonstrated the width of the vein in the Howland mine; we have been down 80 feet, and worked across it, as we supposed, 33 feet without finding any wall, all being solid ore. We have really not found the bounds of the mine yet at all. These are all the mines we have worked.

Q. Do you know of any mines worked by other companies or individuals, in that region?—Not in that region.

Q. In any other region?—There has been a great deal of work done some 40 miles north of Madoc, in the township of Wollaston, by the parties connected with the Ontario Central Railway Company.

Q. Is there any export duty on the ore?—No.

Q. Have you any duty to pay to bring it into the United States?—Yes; 75 cents per ton.

Q. Is that upon the gross ton?—Yes; upon the gross ton of 2,240 lbs.

Q. Have you considered the subject of smelting that ore here in this country?—We have, very carefully.

Q. What are your conclusions?—We thought it could be manufactured with charcoal to very good advantage.

Q. In consequence of charcoal being obtained in the vicinity extensively and economically?—Yes.

Q. And do you propose to erect works?—We do.

Q. But for any other process of reducing, you think it more advantageous to have it done in the United States?—Yes, at present.

Q. Is that because of the increased manufacture here, or on account of the market for the manufactured article being better in the United States?—On account

of the market. Charcoal iron can be exported to the United States with advantage where anthracite or coke iron could not.

By Mr. Ferguson:

Q. Ho do these ores compare with other ores with regard to purity?—I am personally familiar with the iron deposits throughout the States of the Union and I am also familiar with the iron deposits in other countries by studies of the subject and I have no hesitation in saying that the ores of this region in Canada are freer from objectionable matter and better adapted for the manufacture of Bessemer steel than the ores of any other country in the world. I now produce a copy of a letter which I addressed on October 12th, 1882, to the Chairman of the Tariff Commission in the United States, on the iron deposits of Canada. The letter is as follows:—

"PHILADELPHIA, October 12th, 1882.

"Hon. J. L. HAYES, Chairman Tariff Commission.

"DEAR SIR,—Not having the opportunity of appearing before you personally to present facts and suggestions concerning the importation of Canadian iron ores, to which I desire to call your attention, I beg to hand you the same in writing.

"The constantly increasing demand for iron ores suitable for making Bessemer steel has led to the most thorough examination of every district in our country for the purpose of obtaining such ores in sufficient quantities; but with few exceptions our own ores are not well adapted to that purpose.

"In consequence of the scarcity in our own country and the rapid increase in the production of Bessemer steel, the manufacturers after exhausting every effort to secure a supply from mines within our own country, were compelled to seek a supply elsewhere which has resulted in large importations of this class of ore from Spain, Africa, and other countries; but the large demand caused examinations to be made with a view to procure at least a portion of the supply needed from places nearer by, which has resulted in attention being called to the iron ore deposits of Canada, particularly those of the Province of Ontario, which as already developed, has shown to be of very great extent, and with very few exceptions are equally well suited for Bessemer purposes as the ores being imported from Spain.

"The accompanying statement shows the analysis of most of the deposits in Ontario and includes only such as would be worked.

"Some twelve or fifteen other mines have been opened from which I have not received the analysis, but am told they are all good Bessemer ores. You will observe on the list thirty-five mines are named, and out of these only three are unfit for Bessemer purposes, on account of the presence of too high a percentage of phosphorus, and only four of them have sufficient titanium to be objectionable.

"I also include herein a copy of the records showing the amount of ore mined and exported from Canada to the United States during the years 1878 to 1882.

"From these two statements you will recognize the undoubted value of these ores to our manufacturers; at the same time the development of the mines and the shipment of the ores to our country are quite out of proportion and this can be attributed to the following causes:

"1. The cost of mining in Canada is nearly as great as in our own country, and its nearness to our markets causes a much higher dutiable valuation that usually prevails in case of the Spanish ores, which does not average over $2.50 per ton.

"2. The annoyance resulting from improper valuations, which has so often seemed like a disposition on the part of our officials to discriminate against this trade, that our manufacturers, many of whom are already directly interested in many of these properties, have hesitated as to investing any sums of money beyond what was necessary to test the quality and quantity of the ore.

"3. The low cost of mining the Spanish, ores by reason of cheap labour, their low market value at point of shipment, the low rate of freight to this country, as compared with the higher cost of labour in Canada, and the difference of duties under

the present system along with the doubts and uncertainties always attendant upon developing new mining districts, are unfair discriminations against Canada.

"On account of the absolute necessity of our manufacturers having these ores, many of they have already secured properties in Canada, and of the mines now being worked, they are without exception under the management of our people, so that we are not only discriminating against Canada but against our own direct investment of capital, which we have been compelled to make on account of not being able to get the required quality of ore in sufficient quantities within our borders.

"Now I contend that when we cannot get the kind of ores necessary in our own country, we should, if it were deemed politic to discriminate in the adjustment of our tariff, consider carefully our relations with the various Governments of the different countries from which we can draw our supply of raw material, and in this case while the discrimination is so clearly against Canada it must be admitted that our trade relations with her are far more important than that of any other country from which we can get these ores. The amount of American coal consumed in Canada yearly is now and will continue to be far in excess of the amount of ore we will import from there. Aside from other branches of trade which are equally important to us, our trade with them must necessarily continue to increase from year to year, so that I claim an adjustment of the tariff with Canada, by which these ores can be brought in free of duty, will not to any appreciable extent interfere with similiar interests in our own country but will greatly promote our Bessemer interests as well as being the means of directly adding to the volume of general business between our country and Canada.

"I would therefore suggest for your consideration that steps be taken towards a treaty with Canada which will include the admission by our country of all Canadian iron ores free from duty, provided the Canadian Government will remove the duty and admit our anthracite and bituminous coal into their country free of duty.

"Under the circumstances, such a treaty would undoubtedly be very important to both countries, and all things considered no sacrifice to either, but so advantageous to both in the interchange of traffic, that the general prosperity of both countries would be prompted thereby.

"Trusting these suggestions may receive your careful consideration,

"I am, yours truly,

"CHAS. J. PUSEY,

"42 Pine Street, N.Y."

ANALYSIS of Iron Ores from the Province of Ontario, Canada

Name of Mines.	Location.	Metallic Iron.	Phosphorous.	Titanium.
Seymour Mine	Near Madoc, Ont.	68·83	·0104	None.
Dominion	do	57·81	Trace.	do
Brooke	do	68·37	·023	do
Wallbridge	do	64·61	Trace.	do
Moore	do	64·99	do	do
Dufferin	do	64·60	·013	do
Nelson	do	56·58	·006	do
Benttif	do	68·40	·005	do
Mullett	do	59·25	·013	do
Sexsmith	do	57·18	·017	Trace.
Orton	North of Madoc.	60·30	·027	2·47
Baker	do	62·20	·057	None.
Wollaston	do	60·52	None.	do
Coulson	Near Bancroft.	66·13	·020	do
Dungannon	do	69·77	·020	do
York Branch	do	50·49	·959	do
Bancroft	do	68·27	·012	do
Wager	Near Tamworth.	64·12	·017	do
Paxton	Near Kinmont	55·12	Trace.	do
Swamp Lake	do	62·60	·008	do
Victoria	East of Kinmont.	61·02	·052	Trace.
Howland	do	61·48	·01	None.
Imperial	do	45·82	·02	do
Ledyard	do	55·00	·02	do
Pine Lake	do	53·60	·007	7·91
New York	do	70·38	Trace.	None.
Monmouth	do	70·50	do	do
Cardiff	do	62·10	·180	Trace.
Thompson	North of Kinmont.	67·11	·701	None.
Hull	Near Ottawa.	58·44	Trace.	do
Haycock	do	68·34	do	2·34
Glendower	North of Kingston	64·83	·01	1·32
Chaffee	do	52·36	Trace.	11·43
Roberts	do	62·64	·009	None.
Thunder Bay	North Shore of Lake Superior.	61·36	None.	Trace.

While the above analysis only shows metallic iron, phosphorous and titanium, the analysis was in every case made full and complete, but in no case was there found any other deleterious substances in objectionable quantities.

EXPORTS of Iron Ore from Canada to the United States, for the Years ending June 30th.

From.	1878.	1879.	1880.	1881.	1882.	Total.
Port Hope, Ont.	.....	.....	227	3,969	300	4,496
Whitby	.....	117	.....	654	376	1,147
Belleville	.....	912	15,981	4,698	15,606	37,187
Kingston	3,020	1,680	7,040	11,863	20,359	43,962
Ottawa	.....	.....	6,928	22,259	5,828	35,015
	3,020	2,699	30,176	43,443	42,469	121,907

By Mr. Holton :

Q. Did you state how long you had been in the country ?—Yes ; since 1874.

Q. I suppose you are a trained mining engineer ?—No ; I do not lay any claim to being a mining engineer or a scientist, but I am a practical iron worker.

Q. Have you, in the course of scientific or mining prospecting in Canada, had occasion to apply to the Geological Survey for information and asssistance ?—No ; I have not. I have referred to the reports, but they did not give me the information I wanted ; I have never made a personal application to the office.

Q. What is your opinion of the value to the public of carefully collected mineral statistics ?—I might state that up to the year 1878 there had been no practical working of the ores in Canada, and the United States found the lack of knowledge. We then introduced the Seymour ore and some ore from the Forsyth mine, and from that time forward the knowledge of Canadian ores has been known throughout the United States, and capital has been brought here to do the working of the ores. The value of the ores was demonstrated through the working of these two mines.

Q. Is it your opinion, as a practical man, familiar with these subjects, that the collection and preservation of such statistics as I have referred to would aid materially in the development of the mineral resources of the country ?—I think it would be the means of drawing capital here, which otherwise you would not get.

Q. Has that been the effect in the United States ?—Yes ; I think it has, to a very great extent. The lack of knowledge, as to the value of these deposits, has lost you the capital from there.

Q. Have you formed any opinion as to the efficiency of the Geological Survey of Canada ?—Well, I have really given so little attention to it that I would be hardly able to answer your question. I have examined some of them, and found so much irrelevant matter, that I did not care to bother with them.

By Mr. Baker ;

Q. Have you any knowledge of the extent, nature and value of the coal in Vancouver Island ?—I have not.

Q. And consequently you cannot tell how it compares with the coal in the opposite territory of Washington, either personally or by hearsay ?—I understand, from those who are interested in it, that it is superior to the coal in Washinton Territory.

Q. And fetches a higher price in the San Francisco market ?— Yes.

Q. Do you not think it would be mutually beneficial if reciprocity between the United States and Great Britain were entertained in the matters of coal, coke, and iron ore ?—Yes ; to both countries.

Q. Are you aware of any steps having been taken in this direction ?—In 1882 a Commission was appointed by a Congress to revise the United States Tariff. That was the origin of this movement towards reciprocity in coal, coke and iron ore, which has resulted in the introduction of a Bill which I have prepared for the present Session of Congress, asking the United States Government to take off the duty on coal, coke and iron ore when the Canadian Government does the same. This Bill is now under consideration in Congress.

Q. And I suppose the Canadian Government are equally waiting to do the same ? Who is to take the first move ?—Yes; I suppose so.

Q. Do you think that reciprocity, if carried into effect, would be equally reciprocal as regards both countries ?—I think so.

Q. You know as a fact, do you not, that the export of coal from the Province of British Columbia is equal to, if it does not really exceed, all the other Provinces put together ?—It is probably double the amount of any of the other Provinces. About 200,000 tons of coal are exported annually to the United States from British Columbia, while about 100,000 tons are exported from Cape Breton and Nova Scotia. The following statement shows the coal imported into Canada from the United States for the year ending 30th June, 1883, and also the coal and iron ore exported from Canada to the United States during the year ending 30th June, 1883 :—

Coal Imported into Canada from the United States for the Year ending 30th June, 1883.

Province.	Anthracite.	Bituminous.	Coke.	Total.
Ontario	339,586	736,176	7,267	1,183,029
Quebec	208,532	3,869	494	212,895
Nova Scotia	19,355	3,618	.....	22,973
New Brunswick	43,911	638	.....	44,459
Manitoba	13,919	90,628	129	104,676
British Columbia	356	373	2	731
Prince Edward Island	1,597	43	.....	1,640
Total	727,256	835,345	7,892	1,570,493

Coal and Iron Ore Exported from Canada to the United States in the Year ending 30th June, 1883.

From	Coal.	Iron Ore.
Ontario	.....	42,745
Quebec	2,120	.....
Nova Scotia	110,150	.....
New Brunswick	17,670	.....
British Columbia	172,863	1,890
Total	302,803	44,635

John Macoun, Esq., of Ottawa, botanist to the Geological and Natural History Survey of Canada, was called and examined.

By the Chairman:

Q. How long have you been connected with the Geological Survey, and in what capacity?—As botanist I have been permanently attached to the Survey for two years, up to last January, but for ten years I have gratuitously examined all the botanical collections made. In 1875 I was appointed by the then Government as botanist with Dr. Selwyn, to British Columbia, and I spent the whole summer there botanizing. That report appears in the Geological Report for 1875-76.

By Mr. Holton:

Q. I believe you are attached to Mr. Whiteave's department?—He has control of the Natural History department, and I belong to that branch of the Survey.

Q. He is your chief?—He is my chief, but he never interferes with my duties. When I was made aware of my permanent appointment, I went to Mr. Whiteaves and said I was subject to his orders.

By the Chairman:

Q. What has been your previous training and experience?—I do not wish to be egotistical, but twenty years ago I was an authority on geology; however, during the last four or five years especially, I have put geology out of sight, because I am on another line. For thirty years I have studied geology, and was a Professor of Botany and Geology in Albert College, Belleville, from 1868 to 1879, when I resigned. In 1866 I was considered an authority in the City of Belleville, and was sent out to examine the gold region north of that city, in the interests of those who had money invested in the mines, and my report was so satisfactory that they hedged in time and saved money. Of course this was not in a public but in a private capacity. I might mention that as early as 1862 Sir William Logan wrote me that he would have me appoint-

ed on his staff, only his means were so small he could not promise me enough to live upon (I was married at the time), so I was not attached to the Survey at that time.

Q. Would you care to furnish to the Committee your views as to the general efficiency of the Geological Survey under its present system?—I have not the slightest objection to give my views. My views are my own and I am responsible only for them. In 1872, Mr. Sandford Fleming, asked me to accompany his expedition to British Columbia to examine the great plains. I made a report then that suited Mr. Fleming, and when Dr. Selwyn saw it, he said: "I wish I could have that man with me on my contemplated expedition to British Columbia." At that time, Mr. Mackenzie's Government was in power, and when I was applied to by Mr. Fleming, I said I was doubtful of being appointed; however, I was appointed by Mr. Mackenzie. I never saw Dr. Selwyn until I reached Victoria, where we had our first conversation. He said to me, "Now, Mr. Macoun, try and do as well for me as you did for Mr. Fleming and I will do by you as Mr. Fleming did," and that was, "Macoun, do the best you possibly can, and you will get all the credit you deserve." Well, I, of course, worked hard all summer, and took all the notes I possibly could. That report was published in 1875, and there were 120 or 130 pages of it. That gave me this impression of Dr. Selwyn, that if you work hard he will give you credit, and that has been my impression up to the present time. My impression of Dr. Selwyn is that if he finds one of his subordinates doing the best he possibly can he will give him a good show and do the best he can for him. Dr. Selwyn, if he were to send me on an exploration, would say "How much money will be required to make such an exploration," and he would give the amount to me, and allow me to choose my own assistants, and my aim has always been to be successful. I know of no instance, so far, in which Dr. Selwyn has not done this. I have been ten years backwards and forwards, and so far as my information goes, I believe Dr. Selwyn's aim is to have good work done and give good results to the public. I have known no instance where he has interfered in any way.

Q. Then your impression is that where the work of the explorers has not been published in the annual volume it is because it was not of a nature to be embodied in the report?—I positively do, and I will tell you on what I base it. I am an old professor and teacher, and as an examiner, when I found the paper of a young man who thought he knew very little, and actually did know little, I would consider it, but when I received the paper of one who thought he knew a great deal and knew less, I would throw it out. If I were in Dr. Selwyn's place I would not publish any report papers unless they were of sufficient value to be published. It is a serious matter to publish what is called science, but which has no scientific value at all. These are my impressions only.

Q. Would it not be more in the public interest, if such men are attached to the staff, that they should be discharged at once and that no expenditure should be made upon their explorations and no time wasted in making them?—Yes; that is precisely my impression. It is a great mistake to give means to men who are incompetent, because their work has got to be done over again, and it is thus twice paid for.

By Mr. Baker;

Q. Do you think that your impressions have been subsequently substantiated, and if so, cite instances?—I will answer that in this way. If it is shown that Dr. Selwyn has suppressed valuable reports, then, in my opinion, Dr. Selwyn is wrong.

Q. We all agree to that?—I cannot answer your question except in a particular way.

Q. Do you not think that reports coming from persons who are supposed to be competent should be given to the public for what they are worth, the Director, if he does not agree with them putting a note at the bottom of the report to that effect?—I feel just this way, that where the Director is satisfied that the report is inaccurate he would be doing a great wrong to himself if he allowed it to go to the public as a correct report.

Q. But if he qualifies it by a statement that he does not agree with it?—That is his own business. If you refer to a particular instance, then I will answer your question.

Q. But I wish to ask a general question?—And I have given a general answer.

By Mr. Dawson:

Q. Dr. Selwyn, the Director of the Geological Survey, who is now present in the room, is your superior officer, I believe?—Yes.

Q. You spoke of incorrect reports being sent in, which you believe to be to the general advantage to suppress?—I did not state so.

Q. But you implied that they were?—Very well; I will even admit that I implied it.

Q. You are not aware of any particular inaccurate reports having been sent in, are you?—Dr. Selwyn never showed me the report of any gentleman and asked me my opinion, or read me any portion of it in any case.

Q. Then you have no actual ground for supposing that incorrect reports were sent in, unless any of these published reports were incorrect?—Dr. Selwyn has refrained from publishing reports that have been sent in to him, and if he did so on the ground of their being unsatisfactory, in my opinion he was acting quite right. If he suppressed reports through spleen, or spite, or from any other cause than their want of value, then I decidedly say that he was wrong.

Q. That is a very general opinion, which no one would dispute. If any incorrect report was sent in he would be justified in holding it back. But you do not mean to specify any particular instance?—No. I am speaking merely from my impressions and from my experience, and I have just as long an experience as many others, about thirty years.

Q. Most of the members of the Committee have read, with a great deal of interest, your reports and the information you have given with respect to that great tract of country north of Lake Superior, and of your journey from Kaministaquia to Rainy River. Do you not think it is highly desirable that this very large region extending from Abittibi Lake away westward to the waters of the Rainy River and down to the south of Hudson Bay, between Lake Superior and Hudson Bay, which forms a great portion of our territory, should be examined, in order to obtain information as regards its flora, and to judge of its climate from that?—I do, and over two months ago Dr. Selwyn pointed out to me, on the map in his room, this very tract of country, and it is set down for me this summer to examine the country on the line of the Canadian Pacific Railway, from Nipissing westward to Kaministaquia. I am very glad that you mentioned that, because I think it is important that a man like myself should be in that country. I have studied botany so long that I could tell the climate from the flora.

Q. It is to be hoped that your explorations will not be confined to the mere line of the Canadian Pacific Railway, but that they should extend from Hudson's Bay to Lake Superior, on the other side?—I will do what I am told.

Q. Do you not think it desirable that it should be done?—I believe that the country is considered valuable, and should be examined.

Q. Its geographical position renders it a matter of very great consequence to the country at large that its value should be ascertained, as regards its agricultural capabilities, its mineral resources and everything relating to it?—I think so.

Q. A little to the north of the Canadian Pacific Railway the rivers are navigable, and the tributaries of the Moose River running down to Hudson's Bay could be navigated with little canoes, so that the navigation down to Hudson's Bay would not be expensive?—I will tell you, honestly, that I would not allow any subordinate that would be sent with me, the privilege of examining a tract of country without I had my eye on him.

Q. But you could judge as to his conclusions?—I have not the greatest of faith in subordinates carrying out their instructions.

Q. I am very glad that the subsequent information we have got establishes the accuracy of your former report with regard to that country?—I examined the Kaministaquia Valley, in 1869.

By Mr. Holton:

Q. You have in your answers to the Chairman's questions, stated a good deal with regard to Dr. Selwyn's capacity and qualifications, but nothing with regard to

the general efficiency of the Survey. I would like you to state to the Committee if it is your opinion that the Survey stands as high in the scientific world as it did in times past, and whether it is now doing good practical work for the benefit of the country?—As regards the general efficiency, as far as I can see, the aim of the Director and the staff is to do the work as efficiently and as completely as possible, but the efficiency of the Survey is marred by chronic dissatisfaction in the minds of some of the members. I cannot say what is the cause of that dissatisfaction; I thought it was small salaries, but I am told it is not.

Q. How long has this dissatisfaction existed?—Since I joined the Survey, and for years before as well. If I were on my oath, I would say that I always believed that it was dissatisfaction on account of small salaries.

Q. In what way does this dissatisfaction appear on the surface?—Grumbling and chronic discontent.

Q. How does it evince itself?—If one does not like a person, one will try to thwart him, and that is the outcrop of the discontent on the staff. In other words, Dr. Selwyn has the interests of the country, and the interests of the Survey more at heart than any other member of the staff. If I am dissatisfied with Dr. Selwyn, I will try to thwart his ideas, and I believe there is on the staff a tendency to thwart the ideas he wishes to carry out.

Q. Why should this be so?—When St. Paul was at Ephesus, one section shouted, "Great is Diana of the Ephesians," and another section, "Great is the other God." The Diana of the Survey is Dr. Selwyn, and the Diana of the past is Sir William Logan, and the cry of one section is, "Great is Diana of the Ephesians," and the other section, "Great is the present God."

Q. Will you please give briefly and succinctly your opinion of the present efficiency of the Survey?—In my opinion, as I said in my first statement; I have studied geology for thirty years.

Q. But you are not answering my question?—I am. I have watched the progress of the Survey, and I tell you, Sir—and I challenge contradiction—that the Survey stands higher to-day than it ever did in the scientific world.

Q. How do you know it?—Because I read scientific papers. Geology is a progressive science, and anyone who says not knows little about it, and hence cannot make a statement. Geology being progressive, if men stand still in connection with geological knowledge, are they not going behind? I tell you, if you read the reports of the Geological Survey you will find that it has progressed from crude notions to fixed ideas.

Q. I want you to state your authorities for distinctly stating so?—I will mention two names. Sir William Logan commenced in 1844, and he published a report, and I have read every report since that time up to the last one that was issued, and it has been constant progress, and to-day Canadian geology stands higher than it ever did before.

By the Chairman:

Q. —It ought to be, after forty years?—Exactly.

By Mr. Holton:

Q. What is to-day thought of our Geological Survey amongst the scientists of England, France, Germany, Italy and the United States?—With the exception of what I have heard in this City of Ottawa, I have never seen a statement against the Survey, either in print or heard it from any scientific gentleman. When Prof. Hyatt, of the United States, was here at the Royal Society, he stopped at my house, and I had a long talk with him about it.

Q. I am not asking what these people generally say or will not say, but what is the opinion amongst scientists in these countries with regard to our Survey. Take England, for instance?—Can you show me in print one statement in opposition to the Survey?

Q. I am not here to answer questions but to ask them, and I will ask them too?—Give me a chance to answer.

Q. I am giving you every opportunity?—How can a man make such a statement off-hand.

Q. You made a statement that you read all the reports. Do you feel competent to express an opinion upon the question I have submitted to you?—Yes.

Q. Then express it?—I have expressed it.

Q. I have asked you?—You must be a lawyer.

Q. No; I am a politician?—Oh no, you are ahead of a politician.

Q. The desire of this Committee, as it is my own desire, is to have the fair expression of opinion of all the gentlemen who come before us, as to the points. We are not scientific men, but we are very anxious to know just how this Geological Survey of ours stands to-day. What is its reputation among the scientific men of England?—I will send in written authorities if you will allow me.

Q. But in your opinion, as a scientist?—If you are a lawyer you want the documents.

Q. Generally speaking, I would prefer documents, but it is your own utterances I want now. You have stated to us that you feel competent to express an opinion. Express it?—Have I not done so.

Q. No; you have shot off in 500 different directions?—I can get documents from the United States.

Q. We don't want that?—I am unable to give any authorities from recollection in support of the position I have taken in reference to the standing of the Survey in other countries.

Q. Is the Survey at present doing good practical work?—I believe so. The men who are now on the staff—Mr. Fletcher, Mr. Ells, Dr. Bell and Dr. Dawson—I leave out Dr. Selwyn because he is at the head, but these other four gentlemen are all competent and willing men. These men I know, from personal experience in the field, will go into difficulties and dangers that would cause bigger men to shudder, and these go to their work in the proper spirit. Dr. Bell has been twenty-five years on the staff, and he ought and I believe has improved every year; Dr. George Dawson ought to be improving every year, and Mr. Ells and Mr. Fletcher are both old men on the staff, and surely they ought to be learning every year. I am positive they are doing good practical work for the country.

Q. Where are we to find the results of this work?—In the special reports; in the maps, and in the amount of material that is now in hand in the office of the Survey, when put in proper shape. If you only knew what these men do for the pittance they get, you would be of a different opinion.

Q. We do not express any opinion as to inefficiency. We want yours?—They are doing good work, of practical benefit to the country.

By Mr. Baker:

Q. You evidently infer that we have preconceived notions of the inefficiency of the Survey?—If I expressed any such opinion, I take it back. I am asked my opinion as to the efficiency of the Survey, and I answer that I know no man who shirks his work.

By Mr. Holton:

Q. Can you not draw a line between the service and the men who do that service?—I do.

Q. Then your mind is more acute than mine?— If the summation of the work is impractical, the men are impractical. I may be illogical, but I think if the men are practical, the result of their work is practical, and I say they are practical and efficient men.

By Mr. Dawson:

Q. You consider them all good geologists—Messrs. Dawson, Bell, Fletcher, Ells and Whiteaves?—Mr. Whiteaves is a specialist, like myself.

Q. You consider them all competent and efficient men?—Yes.

Q. But there is a little dissatisfaction and grumbling?—Yes.

Q. It seems to be more in the organization and arrangement than any want of capacity?—There is no want of capacity; nothing stops grumbling so much as a liberal allowance to live upon, especially if you are a married man.

By. Mr. Holton:

Q. How many special reports have been published by the department with which you are connected during the last ten years?—I cannot tell that, but I can tell the

number last year. I published one, Mr. Whiteaves has published, or is publishing, three, and Mr. Foord published another, and I think there might have been another, but I am not sure. At any rate, I know of these five for a certainty, and the amount of knowledge that was required to publish these is not knowledge that could be gathered in a few days. It is the accumulation of years, as all scientific knowledge must be.

Q. Are members of the Survey encouraged by Dr. Selwyn, or allowed to contribute to scientific societies and scientific papers outside of the Survey reports?—Yes; but if they write to a scientific paper, they must say that it is written by a member of the staff, in other words, the survey must get the credit for what is written. It is transmitted through the Director.

Q That is a rule of the Survey?—Yes; it is as regards myself. Dr. Selwyn told me some time ago, when I first wrote for the Royal Society, that if the paper was the result of knowledge obtained on the Survey, it was but right that the Survey should get the credit for it.

By Mr. Baker:

Q. You have stated in your evidence that if you were instructed by the Director of the Survey to do a certain work, you would do it at all hazards?—Yes.

Q. Would you obey orders and break owners?—Yes.

Q. But your discretion might lead you to do otherwise?—When I was sent out by Mr. Lindsay Russell, he would say, if I could not strictly carry out my instructions, owing to circumstances, I was to use my discretion. Dr. Selwyn never did this, but he implied it. I think if Dr. Selwyn said to do a thing I would obey orders at all hazards

Q. As a professor and a scientist, you do not consider that you have any discretionary power or any individuality when you are so sent out?—When I am sent out to do a certain thing I consider I must do as I am told, if possible, but I may do more and get additional information which is not in my instructions at all.

Q. Supposing you receive your instructions to go to the western extremity of the North-West Territories to perform a certain work, and that on arrival there you find it utterly impossible to prosecute that work to advantage and with a judicious expenditure of the public money, would you still consider it your duty to go on with it?—"Can't" is not in my vocabulary If I found it impossible when I got there, and that it would be an injudicious expenditure, I believe I would *not* carry it out.

Q. Then you would not obey orders?—There is no such thing as "can't" in my vocabulary.

Q. You say, with the exception of yourself, which is evincing no small amount of egotism, that Dr. Selwyn has the interests of the Survey more at heart than any member of the staff?—No; I put myself with the great majority. I said that Dr. Selwyn had the interests of the Survey more at heart than *any* other member of the staff.

Q. You mean to say that nobody has the interests of the Survey more at heart than the present Director?—Yes.

Q. Now, you mentioned, in speaking of the officers of the Survey, that certain gentlemen ought to be, and certainly were, improving. You made one exception to this. You stated that Dr. Dawson ought to be improving, but you did not say whether he was. Did you intend to convey the idea that he was not?—No; I think he is the most progressive man on the staff.

Q. You are of opinion that the small salaries are a serious drawback to the zealous prosecution of the work by the gentlemen composing the staff?—Yes; and I believed at the time that it was the cause of the dissatisfaction.

By Mr. Dawson:

Q. Geologists seem to differ among themselves quite as much as miners do. For example, Dr Hunt has written some interesting articles on a very important group of rocks, which he calls the Animikie or Thunder Bay group. Dr. Selwyn differs from him, as to the age or horizon of this Animikie group, and believes it to be lower by many thousands of feet than the Keweenian group on the opposite side of the Lake. There is a difference between them, of some five miles or so, as to the relative altitude of these two groups, while other geologists, equally capable of judging, place

them on about the same horizon. So with regard to the Quebec group, there is a great diversity of opinion among scientists. They seem to toss and twist the earth's surface in the way that best suits their different views, yet they must criticise the miners, who are at least, quite as consistent as they are, and far more practical?—I am very glad you mentioned that. There was quite a discussion at the meeting of the Royal Society, last spring, about it between, Dr. Selwyn, Dr. Hunt and Mr. Macfarlane. I don't think that Dr. Hunt could have been up there.

Q. Yes; he was, for he stayed a week at my house?—He showed very little knowledge of it, at any rate. After hearing the discussion I came to the conclusion, and nearly all others who heard him, that Dr. Hunt was talking about what he did not clearly understand. Dr. Hunt is an eminent chemist, but he is not eminent as a stratigraphical geologist.

Q. Do you not consider Prof. Chapman an eminent geologist?—He wrote a little book on geology, and if he knew as little about the rocks in the east as in the west, he knew very little about them.

Q. To give a practical turn to the information I have elicited from you, do you not think that the time of the Survey is too much taken up with those matters which are not of interest to others, with the exception of scientists and geologists? A great deal of hair-splitting has taken place with regard to these rocks, such as the Quebec group and the Animikie group, which may be very interesting to sciencists, but not the general public, and which has taken up too much of the time of the Survey. Do you not think so?—I agree with you that this hair-splitting among geologists is of no interest to anyone outside of themselves, and if money is spent foolishly, for the settling of these questions, it is of course impractical, but the difficulty is to tell where the hair-splitting comes in, and where it does not.

Q. But still you are of opinion that the whole Survey might have a more practical turn?—I would say that my branch is the real practical one, while the geologist would say that his branch was.

Q. Nobody denies that we receive a good deal of advantage from the Geological Survey, but the question is, might it not be improved?—Certainly.

By Mr. Baker:

Q. Do you mean to tell the Committee that Prof. Chapman, who has been teaching geology in Toronto University for a great many years, knows nothing about it?—Only as regards the western rocks. The eastern ones I know little about. He wrote a book and talked about rocks he never saw.

Q. Then the Committee is to understand that your remarks simply refer to the western rocks?—Certainly. It would not be prudent for me to speak about matters of which I profess to know very little.

(The following circular was sent to several Scientific Institutions and Professors of Science.)

"OTTAWA, March , 1884.

"DEAR SIR,—A Committee has been appointed by the House of Commons of Canada 'to obtain information as to the methods adopted by the Geological Surveys of this and other countries in the prosecution of their work, with a view of ascertaining if additional technical and statistical records of mining and metallurgical development in the Dominion should not be procured and preserved.'

"The Committee is desirous of procuring information from persons connected with Geological Surveys, Bureaux of Mineral Statistics, &c., in other countries, in reference to recent progress in those departments, with a view of recommending to Parliament such modifications in our own system as will tend to render it more efficient and successful.

"The Committee will therefore consider it a favour if you will furnish it with a list of works on the above subjects, published by you or under your direction, or the works themselves, if furnished by your Government for general distribution, and will also be much pleased to receive your views upon the subjects mentioned and specially:—

"1st.—As to the desirability of procuring and preserving mineral statistics.

"2nd.—As to the desirability of calling special attention to the various minerals of economic interest, their application, their extraction and their treatment.

"3rd. If desirable, whether the work should be done in connection with and as a subordinate department of the Geological Survey, or by a separate and independent department or bureau.

"A reply at your early convenience will oblige,

"Your very truly,

"ROBERT H. HALL, *Chairman.*"

"UNIVERSITY OF NEW BRUNSWICK,
"FREDERICTON, N.B., 20th March, 1884.

"DEAR SIR,—I have the honor to acknowledge the receipt of your communication of March 13th, asking, on behalf of a committee of Parliament, my opinion upon certain points connected with the collection and preservation of mining and metallurgical statistics within the Dominion. In complying with the request, I may state that such views as I have to offer have been suggested to me partly through personal observation, extended over some fifteen or twenty years in connection with the geological investigations of this Province, and partly through the perusal of geological reports elsewhere.

"As to the general question of the desirability of 'obtaining and preserving technical and statistical records of mining and metallurgical development,' only one answer can, I think, be given. The more complete, thorough and accurate such statistics the greater their value, and the greater the necessity for their preservation in a permanent and readily available form. This necessity is universally recognized in all communities of advanced civilization; the only differences are as to how such results can be most effectually obtained. It may not be out of place to give here a brief statement of what has been done in this Province in this direction.

"My present position was assumed in 1861. Up to that period the only publications bearing upon the mineral resources of New Brunswick were those of Dr. A. Gesner, and of Prof. J. W. Johnston, the former being a series of reports on the geology of the Province; the latter chiefly on its agricultural capabilities, but including also references to its geology. In both, the references to economic minerals are few, scattered, incomplete, and subordinate to the presentation of other subjects.

"With a view to inform myself better upon these particular topics, as well as to obtain a basis for their future investigation, I undertook, in 1864, by the advice and with the pecuniary assistance of Governor Gordon, to visit different sections of the Province and to collect such data as were available, relating to the condition of its mining industries at that time, the results of which examination were subsequently printed and presented to the Provincial Legislature. They, however, from the want both of time and means, were necessarily of a very meagre and unsatisfactory character. A copy of the report in which they are contained is herewith transmitted.

"Subsequent to the publication of this report 'on the Mines and Minerals of the Province,' my attention has been directed, with but little interruption, to the study of its geological structure up to the present time, partly by private exploration and partly in the service of the Provincial and Dominion Governments. I am thus brought to consider the ways and the extent to which the official surveys, and more particularly the Geological Survey Canada, as conducted in this Province, has operated in the direction referred to.

"The instructions under which I have acted, received first from the late Sir W. E. Logan, and later from his successor, the present Director of the Geological Survey, have, in most instances, related primarily to the determination of the age, position and structure of the rock formations in different sections of the Province,

with a view to the construction of correct topographical and geological maps of the districts surveyed. This, I believe, to be the first and most essential requisite of every systematic Survey. While recognizing this, however, as the main object to be attained, at least in all preliminary investigations, I have always understood it to be the duty of those thus engaged to observe the occurrence of all minerals likely to be of economic interest, to collect such data as were available concerning them, and to embody the information thus obtained in the reports submitted. On reference to these reports, it will be found that in most instances special chapters or sections are contained, devoted to this subject, and containing as complete information as it was possible to obtain relative to the subjects discussed. In addition to these chapters, special reports have been prepared on the Grand Lake coal field, on the Albertite deposits of Albert County, on the iron ores of Carleton County, and on the economic minerals of the Province in general, for use at the Philadelphia Exhibition.

"In 1870, a circular relative to the collection of mining statistics was prepared by the present Director of the Geological Survey, and distributed in this Province, the answers to which, as compiled by Mr. Robb, are contained in the Report of Progress for 1871-72. Great difficulty was experienced in obtaining the desired information, and the returns, as far as they relate to this Province, are both meagre and incomplete. No systematic records of work since done have, so far as I am aware, been made.

"As to the desirability of a change in the methods of obtaining and preserving such information, it is my belief that this can be best done through the employment of one or more officers, whose special duty it shall be to personally visit and investigate the condition of various mining industries, to collect and preserve statistics relative to the latter, and from time to time to publish reports thereon, with suggestions as to profitable fields of exploration, improved processes, new applications, &c. My criticism upon the present system, if any, would be that it leaves the information desired scattered through many volumes, in connection with a variety of reports, and in a form which, through the difficulty of finding it, makes it practically unavailable to the great mass of the people. Such work should also, I think, be in the hands of a trained specialist or expert, rather than in those of the ordinary surveyor, whose time and attention are already sufficiently occupied in other directions. I see no reason, however, why such work should not be subordinate to the general work of the Survey and to its head, and believe that the best results would be attained by such subordination. This is the case with most of the Surveys of which I have any knowledge, and especially with the National Survey of the United States, as recently organized; though sometimes, as in Nova Scotia, the duties of such an office may be to a large extent, performed by a Special Commissioner of Mines.

"I may here further suggest, as being in my mind a desirable change from the system now followed, that collections of rocks, minerals, fossil and economic products should, as far as possible, be made in duplicate, one set to be forwarded for permanent preservation in the Geological Museum, at Ottawa the other to remain in the Province where the collection is made, and where it is chiefly of service for purposes of instruction and reference. Such local collections, which could be easily made, would greatly assist such publications as are referred to in your second question, and of the desirability of which I entertain no doubt.

"I have the honour to be, Sir, Your obedient servant,

ROBERT N. HALL, Esq., M.P. "L. W. BAILEY."

"HALIFAX, NOVA SCOTIA, PROVINCIAL MUSEUM, 20th March, 1884.

"DEAR SIR,—I appreciate highly your courtesy in asking my advice on the subject of geology, and the development of the mineral resources of our great Dominion. As, however, the Director of the Geological Survey, and I have had occasion to differ in opinion so often on radical points in geology, I am afraid that suggestions made by myself would be ungraciously received on his part, and consequently would remain a dead letter.

"The last reports for 1880-1-2, just received, are certainly largely disappointing as far as relates to geology. I would remark first, in regard to the new name, Geological and Natural History Survey. It may have been expedient to add Natural History to the Geology. I think the two should have been kept apart, and placed under separate directorates. The two get wonderfully mixed up in the reports. Second, a new nomenclature is being introduced which is very bewildering, and different from that of all Surveys with which I am acquainted, *e.g.* H. M. Geological Survey of Great Britain, the great Surveys of the United States, and from that taught by standard works on geology, and the teaching of our colleges and schools of science. In Nova Scotia, which has been my special field of work for the past twenty years, and which has been a field for geological research for upwards of forty years, where eminent geologists, home and foreign, and skilled mining engineers, have successfully operated, the "geological corps" is commencing to operate *de novo*, a region not being considered examined, if the "geological corps" has not examined it. From the reports it seems that new maps topographical have to be constructed for geological purposes, although the Nova Scotia Government has subsidized a party in the construction and publication of county maps of the whole Province, which I, at least, have found easily convertible into geological maps, and which the late Sir Wm. Logan recommended and used when I was assisting him in his surveys of Pictou and Antigonish County. These maps are used in the Mines Department of the N. S. Government, and are found well adapted for indicating mining areas.

"My own geological work has been fully reported in the Journal of the Geological Society of London, 1863 and 1864, and in the proceedings and transactions of the Nova Scotia Institute of Natural Science, from 1867 to the present time. This has been illustrated by maps, which have not been published. These were used in my classes in Dalhousie College.

"The transactions, which are now largely out of print, are to be found in the Parliamentary Library—the Geological Survey Library—as well as in libraries throughout the world.

"The statistics of the mines of Nova Scotia are contained in the series of Annual Reports issued by the Hon. Commissioners of Mines and Works.

"I think that an officer of the Geological Survey should have charge of mining statistics.

"The Hon. Mr. Gayton, Commissioner of Mines and Works, says he is ready to furnish the reports referred to or give any information that it is in his power to give, relating to maps and statistics.

"I have the honour to be, Your obedient servant,

"D. HONEYMAN.

"ROBT. N. HALL, Esq., M. P., Ottawa."

"MINES OFFICE, HALIFAX, 21st March, 1884.

"SIR,—In answer to your letter of March 13th, I beg permission to remark :

"1. I consider the collection and preservation of mineral statistics a matter of very great importance. The Nova Scotia Government, the owners of the chief minerals found in the Province, have been very particular on this point for some years past. I enclose A. B. C. D. gold and coal returns which will show that they are very comprehensive. The returns form a condition of all leases, and their neglect renders the lease forfeitable.

"They are made under oath, See (E) Mines and Minerals Act, sections 53, 62, 102, 108, &c., &c., and are always exacted. In the case of mines not held under lease from the Government, annual returns of ores raised and labour performed are required. See (F) Miners Regulation Act, section 15. Summary penalties are also thereby provided for neglect. From these various returns are compiled the statistical tables shown in (G) Mines Report, pages 38, 64.

"It will thus appear that our system is practically working, and it is frequently referred to by investors. Full statistics are essential for legislative purposes, as they check unfounded assertions, evidence, direction of trade, show its relation to foreign mineral trade, and furnish the safest data for mining legislation.

"I give an instance at present affecting this matter.

"We have been levying our royalty on large (or screened coal) only, allowing fine (or slack coal) and that used about the collieries to pass free. Desiring to meet the demands arising for unscreened coal (coal to be sold as it comes from the miner) and to check any excessive use of coal about the mines, we are proposing to put an equivalent royalty on on all coal raised. Thanks to our returns of total production, of large coal sold, small coal sold, and of the amounts of each used by workmen, and by engines, &c., we can readily fix the equivalent, otherwise tedious and expensive checkings would be required before any conclusion could be arrived at.

"2. My opinion on the second point may be best expressed by referring you to the transactions of the North of England Mining Institute (Newcastle-on-Tyne) which contain papers of mine on the various Nova Scotia coal fields. The composition of Canadian coals, the iron, gypsum and gold of Nova Scotia (copies of the last forwarded to you), also similar papers of a more local character in the transactions of our local institute. Also, report to Provincial Government on Nova Scotia minerals, 1881. (Copies sent). Copies of these papers will be found in the library of the Survey. The subject is one of much importance.

"3. In Nova Scotia the collection and compilation of the statistics referred to is performed by the Inspector of Mines, who is best qualified, from his practical acquaintance with each mine, to detect any errors, &c. I would not be inclined to consider that the collection of mineral statistics in the Dominion, considering the available work being done here, requires 'a separate bureau or department.' Legislation is necessary to provide means for collecting returns and to punish neglect. This having been obtained, it would be necessary for the Government to be able to give an assurance of the general correctness of such returns. In order to effect this, some one must be practically acquainted with the mining operations of the Dominion, by more or less frequent visits to the localities where mining is in progress, to detect attempts at improper returns, and all returns should pass through such person's hands. Such person might, preferably, be a qualified mining engineer and mineralogist, and his familiarity with the subject of Dominion mines and mineral statistics would make his services very valuable to the General and Local Governments.

"I think that the Geological Survey staff should have a mining engineer attached to it. In connection with this, I refer you to Geological Survey Report, 1866-69, containing a most valuable report by the late Mr. Hartley, M.E., made under direction of Sir W. Logan, on the coals of Pictou County, which report is highly prized by all connected with that coal district. Such work has not been repeated.

"Surveys of mineral districts are not valuable, unless made by a field geologist having had special training in mining and prospecting. In all such surveys the advice and co-operation of a mining engineer are requisite to ensure a proper appreciation of the economic aspects of the survey. Reports by a well qualified man on the prospective value of districts, casually referred to as metalliferous in the reports of the field geologists, would be specially valuable, and it must be remembered that the geological mapping of different strata, and the economic consideration of the minerals contained in them, are two different subjects.

"I would suggest that through the appointment of such an officer on the staff of the Survey, both the collection of statistics and the preparation of special reports on economic minerals and mining districts could be arranged for.

"At present we require principally from the Survey work in districts showing or expected to show mineral deposits of economic value, and that, so far as is proper, the Government should set forth such mineral values. It is perhaps a little too soon for the Survey to attempt to rival the profounder researches of well-endowed European Survey staffs, working over ground already surveyed and mapped out. In my opinion, the work of the Geological Survey has been unfairly hampered by being

diverted into colonization surveys, natural history, &c., to the prejudice of legitimate geological work.

"I trust the above may prove of service to you, and will be pleased to hold myself at your further commands.

"I remain, yours obediently,

"EDWARD GILPIN, JR.,

"*Government Inspector of Mines, Province of Nova Scotia.*"

"R. N. HALL, Esq., M. P.,

"Chairman of Committee Geological Survey, Ottawa."

"BELOIR, WISCONSIN, 22nd March, 1884.

"DEAR SIR,—In reply to your question, I would answer: (1) That there is, in my judgment, no question as to the desirability of procuring and preserving mineral statistics; (2) Nor as to the importance of calling special attention to the various economic resources of industrial development. (3) This, in my judgment, can be best done as a department of the Geological Survey.

"I sincerely hope that your Parliament may enact suitable laws for securing to your large domain the benefits of an organized bureau of industrial mineral and mining statistics.

"Yours very truly,

"T. C. CHAMBERLIN,

"*State Geologist.*"

"ROBERT N. HALL, M.P.,

"Chairman, Ottawa, Canada."

"KINGSTON, 22nd March, 1884.

"DEAR SIR,—In reply to your circular of 19th March, I beg to state that I have published no works bearing on geology, except a very brief outline of 'The Geology of the Maritime Provinces,' and a list of 'The useful Minerals of the Maritime Provinces' in Roe's 'Atlas of the Maritime Provinces.'

"1st. Large areas of the Dominion are useless for agricultural purposes, but rich in mineral wealth. The utilization of such regions is desirable in the interests of the country, and would add materially to its prosperity. I am, therefore, of opinion that 'procuring and preserving mineral statistics' would be useful for the purpose of calling the attention of capitalists and others interested in mining to the amount and value of the work performed from year to year in different localities.

"2nd. The 'calling of special attention to the various minerals of economic interest, their application, their extraction, and their treatment,' and permit me to add, their localities, would furnish parties desirous of engaging in mining operations with valuable information which could only be obtained otherwise at great expense, or probably, not at all. The reliability of such information is of prime importance.

"3rd. Though the general character of the work required to be done by a 'Bureau of Mineral Statistics' differs from that of a 'Geological Survey,' a subordinate department ought to be sufficient to perform the work required. Much of the information desired is obtained by the Survey, and the duties of some members of the staff coincide very nearly with those which would devolve upon members of a new department. Some means by which parties finding ores could ascertain their value without much trouble or outlay is very desirable.

"I have the honour to be, Sir, your obedient servant,

"JAMES FOWLER,

"*Lecturer on Nat. Science, Queen's College, Kingston.*"

"ROBERT N. HALL, Esq., M.P.,

"Chairman of Committee on Geological Survey."

"NORTHERN TRANSCONTINENTAL SURVEY,
"NEWPORT, R.I., March 25th, 1884.

"DEAR SIR,—I have yours of the 13th March, 1884. I have the honor to send you certain publications relating to the canvass of our mineral industries for the tenth Census, and also a copy of the first publications of an economic survey of part of the North-West, together with a report of the methods followed in that survey. These are the only reports of Surveys made under my direction, of which I have copies for distribution.

"In reply to your questions, I would say: 1st—That it seems to me extremely desirable to collect and preserve the statistics of mineral industries. 2nd. I consider it equally desirable to call attention to the various minerals of economic interest, existing within your territory, together with an authoritative statement of the character and value of the individual deposits. I consider that the questions relating to the methods of extraction and treatment would be very properly left to the investigations of consumers, since this portion of the work, to be of any value, would require the employment of a different class of expert knowledge from that which will necessarily be required in studying the deposits themselves, and describing them; and also because, while the intrinsic character of the materials as occuring in nature does not change, the methods of extraction and treatment, on the other hand, are so subject to constant improvements and variations in different parts of the consuming world, that it would be extremely expensive and comparatively useless to attempt an annual review of such improvements.

"In regard to your third question, I would say that practice has shown that this work, which strictly belongs under the head of economic geology, is not to be undertaken by men who have devoted themselves to strictly scientific work. It should be done by the best young graduates in mining engineering that can be had, and who should, before entering upon it, visit as widely as possible the different localities where various ores, minerals, and construction materials are worked, in order that they may become acquainted not only with the manner of occurrence, but with the relative economic value of the materials as they occur. In this I have particular reference to the products of quarries—slate, marble, freestone, &c., as well as asbestos, mica, whetstones, and all that class of more or less important products, of which very few geologists are acquainted with more than one or two in quarries proper.

"It appears to me that such a work should be put under a distinctively economic geologist, who might himself have either an independent department or be in charge of a subordinate department of the Geological Survey.

"I should further consider that such a work should begin with a thorough canvass, similar to the one carried on by us for the tenth Census of the United States—that is, every known locality containing minerals of economic value, whether worked or not, should be visited, and commercial samples taken of its products, and these samples should then be subjected to the processes of testing or analysis, according to the requirements of the case. At the same time, the statistics of production, where workings exist, should be a part of the work.

"This work once done for the whole country could then be very easily kept up by a smaller permanent department.

"Yours respectfully,
"RAPHAEL PUMPELLY, *Director.*"

P. S.—The complete volume of my department of the Tenth Census is not yet issued.

"ROBERT N. HALL, Esq.,
"House of Commons, Ottawa, Canada."

(*Translation*). "LAVAL UNIVERSITY, 15th March, 1884.

"SIR,—In your capacity of Chairman of the Committee of the House appointed to deal with the Geological Survey of Canada, you have been good enough to put to me certain questions as to which you are desirous of having my opinion. I beg to

say in reply, firstly: that the *practical* utility of a Geological Survey for a country still young and little known, such as ours, cannot be overestimated. It is quite certain that we have still much to learn about the mineral resources Canada offers us, and no one can throw more light on the subject than an official body of competent men, entirely severed from political intrigues and coteries, and devoting their time, their energies and known ability to promoting the development of our mineral wealth. In furtherance of that object, it seems to me that these men should grapple very specially with the practical side of the geological problems they would have to solve, deal at once and constantly with our mining enterprises, do everything in their power to direct individual explorers, and thus, year by year, save the enormous sums which are utterly wasted in futile explorations.

"The early reports of the Commission were specially remarkable in that respect, and I consider that it is one of the branches of geological enquiry which should receive most attention and development. To give but one instance, we have in Beauce auriferous lands which are, without doubt, highly important, and notwithstanding the explorations made in that section by the Survey, there is still much to be done in the way of examination in detail.

"As to comparing the benefit derived by the country from the Survey with the expense it involves, the question is one of very great delicacy. I consider that it is always sound policy to remunerate liberally men of ability who devote their time to scientific research. Nothing paralyzes zeal and impedes research so much as wearying anxiety of a life in which everything must be calculated with the greatest minuteness if, at the end of the year, both ends are to be made to meet.

"The Survey is costly, it is true, but the results of its labors are, in general, highly important. That the publications, of late years, have produced less sensation than those which preceded them, cannot be denied. But the causes of this may be numerous. In the first place, a man of Sir William Logan's undeniable high standing and intellect, a man of genius and wholly devoted to his profession, is not easily replaced. Moreover, the withdrawal, shortly after Sir William's death, of several extremely eminent men, such as Mr. Sterry Hunt and Mr. Macfarlane, the death of Mr. Billings, &c., largely contributed to deprive our Geological Survey of a portion of the prestige it formerly enjoyed. Besides, the class of work now being done by the Survey is, perhaps, of a nature not so well calculated to strike the public mind as that of earlier days, when everything was new, when each explorer brought in a wealth of important discoveries.

"You ask me, moreover, whether I am of opinion that the defects of our Geological Survey, defects complained of by many, are due to its organization or to the manner in which it is conducted.

"The information I possess on this subject is very slight. I have no precise idea of the organization of the Survey. I do not know the special attributes of the Director and of the subordinate officials. The reports of the Survey have not reached us regularly here of late years, and most of the time we have got them indirectly, through friends in Parliament. Hence, as I do not even know whether the Survey is bound to send its reports to the principal institutions of the country, I must know very much less about its interior working.

"As regards improvements to be suggested, I would most urgently suggest and pray that special attention be given to *our* mineral wealth. This is my opinion, one point of the very first importance. And in this connection let not the older Provinces be forgotten. The last word respecting them, and especially Quebec, has not, by any means, been said. I believe that detailed and methodical researches may give excellent results. Let the Survey not abandon mines in operation. Let a special Board, for that object, be created amongst its members, so that the public may be informed as to the development of our resources. Some of the Provinces have already established Boards for themselves; and so evident is their usefulness that there is no hesitation in completing their organization by adding to the number of members composing them.

"The Geological Survey has added to its old title that of "Natural History Survey." This opens up to it a vast field of research and labor, and the practical results, under proper direction, will certainly be of the highest importance.

"Lastly, I would say, let men of talent, to whatever nationality they may belong, be freely appointed to the Survey. Doubtless these appointments to the several positions on the Survey cannot be a mere matter of patronage; men of ability must be found. But the search for merit and scientific acquirement must be a thorough search; otherwise, there is danger of overlooking men who would have rendered real service, and selecting persons of an inferior talent, who may happen to be forthcoming or recommended.

"Such, Mr. Chairman, are the ideas which occur to me in relation to the enquiry ordered by the House as to the Geological Survey. The subject is an exceedingly difficult one, owing to th thousand and one little secondary or personal questions which may spring from it, but it is also a highly important one, which I am happy to see entrusted to a Committee so enlightened as yours. I am quite confident that the Canadian Geological Survey will emerge from the little storm through which it is now passing, full of vigor and ready to undertake fresh discoveries. With skilful and enlightened management, with good understanding between the members composing it, it is capable of rendering immense service to the country.

"With very great respect, your obedient servant,

"J. A. K. LAFLAMME."

"ROBERT N. HALL, Esq., M.P., Ottawa."

"HARVARD COLLEGE, CAMBRIDGE, MASS., March 26, 1884.

"DEAR SIR,—I have your circular of the 18th inst., concerning the methods of conducting Geological Surveys. My acquaintance with this class of work was mainly acquired as Director of the Kentucky Geological Survey, a position which I occupied for eight years.

"The works published during the period in which I had charge of this Survey were as follows:—

"Reports of progress, consisting of special reports concerning matters of economic importance, assembled in five volumes. There are about fifty of these seperate reports. Each was seperately published; the whole afterwards assembled, year by year, in volumes of about 500 pages.

"Second, memoirs, of which two (2) volumes were published. These contain matters of purely scientific interest.

"My experience is, that the State of Kentucky found it very profitable to publish the most detailed economic reports that could be prepared. To give these reports their full value, they should be arranged to prepare the way for exploitation, other than exploration. Besides the reports, I found it very advantageous to provide intending adventurers with all the help in the way of advice, on the ground, that they desired, at its actual cost.

"I think that it would be a great mistake to seperate the statistical work from the investigation of the geology. Every mine should be frequently examined by the Government geologists. This work can be combined with the statistical enquiry. It is cheaper to do the work all together.

"As to the desirability of procuring and preserving mine statistics, there is hardly any room for doubt. In no other way can a chief geologist see what is from time to time the economic development of the resources that it is his business to keep in mind.

"The Kentucky Survey is at present under the management of my former pupil, later my assistant, Mr. Proctor. I have sent your letter to him, requesting him to forward to you such reports as are still in store.

"Pardon me a suggestion that is pertinent to your general enquiry, though not in the list of questions you put in your circular. The Canadian Survey has done a *great deal* of good *Scientific* work. It seems to me that you are now in a position to begin the exposition of your resources, with reference to the needs of your people. In this way it will be easy to define the interests of its more general work, if properly done—this economic exposition will help rather than hinder the scientific results which it seeks to obtain.

"To take a case in point. The Island of Cape Breton abounds in mines, yet there is no place where an economist can get an idea of what these mines are. The coal and iron of that field are known in a general way, but one hundred pages of detailed economic reports would put them before the public in a way that would certainly be profitable to your country.

"Very respectfully yours,

"N. S. SHALER"

"ROBT. N. HALL, Chairman, Ottawa."

"NEW HAVEN, Conn., 28th March, 1884.

"ROBERT N. HALL, Esq., Chairman of the Committee of the House of Commons of Canada with reference to the work of a Geological and Mining Survey.

"DEAR SIR,—Your communication of the 13th inst. was duly received.

"With respect to your request that I furnish a list of my own works connected with Geological Survey, I have to say that my geological investigations have been carried on privately, and consequently, my publications are scatterd through various volumes of the American Journal of Science, and are given in a brief and disconnected way in my Manual of Geology and my Treatise on Mineralogy.

"On the other points in your communication I would reply as follows:

"I believe it to be very desirable that Mineral Statistics should be collected and preserved under Government direction.

"This work does not necessarily come within the duties of a State Geologist. But it could be connected with a Survey, provided it be entrusted to a separate agent, who should make it his special business. Such information is often collected with difficulty on account of the unwillingness of owners to make known the state of their affairs, and it is in danger of being largely erroneous as a consequence of interested misrepresentations, the fluctuations in the conditions of mines, and the uncertainties of ordinary methods of obtaining values or estimates of values by samples. The work, therefore, requires special qualifications, very different from those needed in a Gelogical Survey.

"Respectfully yours,

"JAMES D. DANA."

"STATE GEOLOGICAL SURVEY,

"UNIVERSITY OF ALABAMA, TUSCALOOSA, 29th, March 1884.

"DEAR SIR,—Your communication of March 13 has been received. The reports issued by this Survey have been sent from time to time to the Director of the Canada Geological Survey. I have at present only those for the years 1875, 1876 and 1881–82. Should these not be found in the Survey library, I will take pleasure in sending them. In answer to the two first questions, I should say, without hesitation, that I deem it desirable to collect and preserve mineral statistics of the states and countries, and to 'call attention to the various minerals of economic value, their applications, extraction and treatment;' and in regard to your third question, my

opinion is, that such would be best done under the supervision of the Director of the Geological Survey, and not by a separate and independent bureau, since in the latter case a duplication and overlapping of work could scarcely be avoided.

"Very Respectfully,

"EUGENE A. SMITH,
"*State Geologist.*"

"R. N. HALL, M.P.,
"Chairman Committee, House of Commons, Ottawa."

"RICHMOND, 31st March, 1884.

"DEAR SIR,—In reply to your circular of 17th March, I beg to say that in my opinion it is very desirable for the promotion and welfare of the mining industries of our country, that mineral statistics should be procured and preserved. To me, this is so evident as to require no argument in its support.

"It is in my opinion, equally desirable that special attention should be called to the various minerals of economic interest, their application, their extraction, and their treatment. I am further of opinion that these desirable results, will be best attained, by a separate Department having that special end in view; for, I am aware, that economic mineralogy is often looked upon as but an illegitimate member of the geological family, and apt to be treated with neglect in consequence; but as the efficiency of the Department will be the measure of its success, it is necessary that it should receive no half hearted support, in order to be useful.

"I might give you a list of some publications by other Governments, but I have no doubt you will receive all this information from other sources, much more fully than I would be able to offer it.

"I remain, yours truly,

"R. N. HALL, Esq., M.P.,
"Chairman of Geological Committee."

"GEO. H. PIERCE."

"ST. STEPHEN, N.B., 31st March, 1884.

"DEAR SIR,—In answering your request for an expression of my views upon the matters under consideration by your Committee, I would, at the outset, state that I hold the degree of Batchelor of Arts from the University of New Brunswick, from which institution I graduated with honors in National Science in 1877. During my undergraduate course, I devoted much of my time to the study of the physical sciences and received two prizes for proficiency therein, one of them being a gold medal presented by His Excellency, Lord Dufferin. I began work upon the Geological Survey of Canada on 29th June, 1877, acting the first season as assistant, first to Prof. Bailey and afterwards to Mr. Ells. During the winter of 1877-78 I attended a course of lectures at McGill College, in mining and assaying, besides devoting considerable time to the practical work of the Laboratory. When not at the College during this winter I was at work in the office of the Geological Survey, and I may thus claim a continuous service in this Department from the 29th June, 1877, to 9th May, 1883. During the season of 1878 I acted as assistant to Mr. Ells, and I again assisted Prof. Bailey in 1879. During the seasons of 1880, '81, '82 I was in charge of a survey party. I am not in a position to refer you to any report of my work, as I have not yet handed any in for publication. If it is any part of the duty of your Committee to enquire into the reasons for my report not being handed in, the Director of the Survey can show you the correspondence in reference to the matter. I will only say this, that Dr. Selwyn's action rendered it impossible for me to complete my report, the suppression of which entails upon the public the loss of the results of four seasons's work and of the expenditure of several thousand dollars.

"I will say, briefly, in regard to the three general questions you desire answered: (1.) That there can be little doubt of the 'desirability of procuring and preserving mineral statistics,' not only as a means of ascertaining the mineral wealth of the country and of indicating to capitalists the proper direction of investment, but as well as a means of increasing our exact knowledge of the subject of mining itself, and of furnishing an important datum in political economy in regard to the question of supply and demand. This is a matter which cannot be carried out by private enterprise, and even if it were the results would lack the confirming authority of an official report, as most other reliable statistics are prepared under the authority of Government. For the same reason a Geological Survey should be a public institution, maintained solely by the State, its officers being removed from all private influences as to explorations and the preparation of reports.

"(2.) It will not need my confirmation to prove the vast importance of 'calling special attention to the various minerals of economic interest, their application, their extraction, and their treatment.' I can conceive of no matter of greater importance to the human race than a thorough knowledge of the mineral composition of the earth's 'crust;' for we are dependent upon the product of the mine to an almost incredible degree. Since so much importance attaches to minerals and their products, most Governments of civilized countries have established geological surveys with a view to ascertaining definitely the exact mineral, as well as agricultural, resources of their respective States.

"(3.) I conclude that you will not think it necessary for me to enlarge upon the 1st and 2nd questions, but perhaps your Committee may give some consideration to my views concerning the question whether the collection of mining statistics and the furnishing of information in regard to economic minerals ought to be the province of the Geological Survey, or of a 'separate and independent department or bureau.' To illustrate my views on the subject of geological science, I will quote from one of the works of a distinguished English writer on geological subjects: 'The study of geology presents itself in two great aspects—one purely scientific, and appealing to the intellect; another mainly practical, and appealing to the industrial necessities of life. In its scientific aim, it examines, maps out, and arranges the rocks of the earth's crust into formations and life systems according to their composition, relative positions and fossil contents; endeavoring to deduce therefrom a connected history of our globe and its successive aspects from the earliest to the most recent times. In its practical effort it takes advantage of this chronological arrangement of rock formations, and endeavors to discover in each those minerals and metals, their quality, quantity, and accessibility, which bear so directly on the acts and industries of civilized existence. Though thus apparently separate, the scientific and the practical cannot in reality be disjoined. The more exact our knowledge of the position and sequence of rock formations, the more certain our economic explorations become; and the more successful our industrial adventures, the greater will be the impetus given to the extension and exactitude of scientific research.' And again: 'There is no profession that comes so intimately in contact with geological phenomena, or stands so much in need of a knowledge of geological truths, as that of the miner and the mining engineer. It is true that mining was practised, and in many instances successfully, long before geology had shaped itself into a science, but even the most successful practice was local and limited, and wanted that grasp of general truths which could enable it to pronounce on other districts, and deal successfully with their altered phenomena. The discrimination of the same formation in distant localities, the varying nature of sedimentary deposits, the relations of the eruptive to the stratified rocks, and the laws regulating the direction, character and effects of faults, dykes and veins, these, and many kindred problems, can be solved only by a pretty extensive acquaintance with the facts and principles of geology. It is true that much in successful mining depends upon mechanical appliances—sinking, lifting, hauling, pumping and ventilation; but the most skilful appliances will not compensate for ignorance of the nature, position, variations, and interruptions of the substances the miner may be in quest of. It is in this way that a knowledge of geology

becomes of use to the miner and mining engineer, whether working among stratified deposits like those of the coal formation, or in metalliferous veins, like those which traverse the older formations.' To my mind there can be no other use for the Geological Survey of Canada, except that practical one of pointing out localties where minerals are found, their extent and mode of occurrence. This was the object in view when the Survey was organized, and it is only when it has so widely departed from its original purpose, and consequently become of the least practical utility to the country, that such attention is called to it as it is now receiving from your Committee, and from the public generally. If the Geological Survey of Canada is not to have the duty of collecting mining statistics and furnishing all necessary information in regard to minerals and their application, it would be difficult for me to understand the necessity of so great an outlay of money as is annually spent in its maintenance.

"It is perhaps chiefly required of me to give such information as I have acquired concerning the Geological Survey, and to point out what I conceive to be its defects. The duty is not wholly an agreeable one, for though I am greatly devoted to the study of geology and think to have attained to some proficiency therein, it is certainly an unpleasant task for a young man to criticise the acts of his seniors, especially where his criticisms are not above the suspicion of being influenced by personal prejudices. But I can assert that so far as it is possible for me to sink the person in the professor, I have done so, and what I have to say is said solely in the public interest and in the interests of true science.

"So far as I could learn during nearly six years' service on the staff of the Geological Survey, there was no recognized system of work, the individuals of the corps being guided largely by their own inclinations, and oftener hindered by the caprice than aided by the advice, skill and judgment of the Director. In the important matter of the selection of the field of work, no attention was paid by the Director to the practical question of the probable economic results to be derived from the examination of any particular locality; and frequently if work had been carried out in strict accordance with the instructions of the Director no practical results could possibly have been attained. And it was a matter of general observation that many admirable and highly important surveys had been only partially carried out, while many others of very little or no importance had been completed, with little to show for, frequently, a very large expenditure of money except, perhaps, a highly colored and inaccurate map or a wordy and unpractical report. And I wish to say here that, though I do not desire to make a scape-goat of Dr. Selwyn for all the short-comings of the Department under his direction, I do believe and think I am able to show, that had the Director been at all competent, or, even being incompetent, had he possessed the slightest tact in the selection and management of men, the Survey would never have become so thoroughly disorganized; and that it is disorganized must be evident to all. I believe Dr. Selwyn to have no measure of fitness for the position he now holds. I know that he is deficient in the proper knowledge of stratigraphical geology, and so far as I am competent to judge, I believe he has but little information in regard to chemistry, mineralogy, and palæontology. As to his executive abilities, I have no high opinion; and in his treatment of his subordinates he was notoriously partial. Perhaps it will not be necessary for me to enlarge upon this subject, though if your Committee desire I can quote much to substantiate my statements. I will repeat, however, that the great defect in the present system of the Survey management is the want of a proper *head*.

"It has been said in evidence before you that there was too much topography being done by the Survey; but with a somewhat more intimate knowledge of this matter, as it relates to the present management of the Survey, than possessed by the witness referred to, I would submit that it is impossible to obtain too much accurate topography. Accurate topographical maps are the basis and absolutely necessary preliminary of accurate stratigraphical geology. But what the learned gentleman mistook for 'too much topography' is really nothing more than too much multiplication of useless and inaccurate maps. It *is* true, however, that too

much of the time of the geologists is spent in the preparation of their maps. Geologists are not necessarily draughtsmen, and even if they were their rough, hard work in the field rapidly destroys that peculiar delicacy of touch and flexibility of fingers, as well as steadiness of hand, so necessary for the finer work of draughting. The geologist ought to plot out his work on a large scale, but to the draughtsman belongs the task of compiling and reducing the work upon one plan and to one uniform scale. While I was on the Survey staff the geologists were expected, in most cases, to be their own map makers; while the regular draughtsman, always an eminently capable man, and whose duty it ought to have been to prepare all maps for publication, was engaged upon other work, that required but little skill and could have been done as well by any of the young men of the office. As a proof of what I state, I would refer you to a careful inspection of the published sheets of the geological map of New Brunswick, prepared by Mr. Ells, partly assisted by myself. Neither of us possesses the draughting skill necessary for the preparation of a map on so small a scale, yet the first sheets of this map were given to the engraver as they left our hands, without being submitted to the examination of that most careful of drughtsmen, the late Mr. Robert Barlow, who was at that time on the Survey. Of these maps I can speak in the most positive terms, and I can say that so inaccurate are they that they ought never to have been published; though I cannot think any blame attaches to Mr. Ells or myself in the matter, for we carried out the instructions of the Director, and the responsibility is his. I would say further, that under Sir Wm. Logan's management the maps of the Survey were standard maps, prepared with the greatest possible accuracy and remaining to-day as the best maps in existence of the regions they illustrate; while *all* of the maps prepared *solely* under Dr. Selwyn's instructions are practically useless, or at the best faulty and inaccurate. Among all this mass of useless and expensive rubbish I can refer with pleasure to the geological and topographical maps of Mr. Hugh Fletcher. To my knowledge no such work as he has done has ever been attempted in Canada since the days of Sir Wm. Logan, and few could have done it so thoroughly as Mr. Fletcher. An inspection of his work, which, as well as of that of the other members of the staff, ought to be made by your Comittee, will prove the correctness of my statements.

"Another great defect of the Geological Survey was the great disproportion between the indoor and outdoor staff, the former greatly outnumbering the latter. It is self-evident that this is the reverse of the proper arrangement. Of course, now, since the entire staff is on the Civil List, it is a matter of less consequence, but when the salaries, as well as the cost of explorations were paid out of the annual grant, the progress of the Survey was greatly hindered. But, even since this obstacle has been removed, there seems no real necessity of retaining the services of so many permanent indoor officials. I do not care, unsolicited, to make any individual references in this connection, and will only point out the simple, general fact.

"Want of sufficient and proper instruments greatly impeded the work of the field geologists. Those used by the Survey were, for the most part, purchased in the days of Sir Wm. Logan, and were mostly used up or damaged through accident or carelessness. Dr. Selwyn rarely trusted to the intelligence of his subordinates when they made requests for proper instruments, and they were generally put off by him with inferior ones, or refused them entirely. Unless new instruments were purchased last year, I consider that a new set should be purchased at once. In purchasing instruments some consideration should be paid to the opinions, or it may be, prejudices of the persons using them; for different persons prefer different styles of instruments in doing the same work, and if a man is suited in his instruments he cannot urge the contrary as a cause of any defect in his work. This principle, however, ought to be reasonably restricted, as it might be liable to abuse, though it is not apt to be.

"The present system of publishing reports has long been a matter of complaint. The large annual report, often delayed for more than a year in order that some particular report might be included in it, published as it is, at a great cost, and sold for a high price, has shown itself a signal failure in the only object it could possibly

attain—the dissemination of geological knowledge. Each report should appear separately, and as soon as possible, after the survey to which it refers, has been completed. It should be accompanied, if possible, by all maps that have been prepared for it, and it should contain all the chemical and palæontological notes that really belong to it. I mention this latter fact because it has come under my notice that chemical analyses have been published in a separate report, and not in their proper place, in connection with the geologists' full description of the rocks and minerals that have been analysed. This is not always possible, but cases have occurred where the rule could easily have been observed. No report should be withheld because the chief officer is not in accord with the views of the writer. When a geologist writes a report, of course he assumes the responsibility of it; and the Director should do no more than express dissent to the opinions of the writer in a prefatory note. Reports should have the freest possible circulation, and should be sold for a merely nominal price. The most practical, and hence the most useful geological reports with which I am familiar, are those of the Second Geological Survey of Pensylvania, and they are prepared in this manner; and I have no doubt that the Canadian Survey could receive many very valuable hints from this Survey in other matters besides the reports. It is well, where possible, that reports on localities should be as full as possible, but this will sometimes cause too great delay, and in these cases preliminary reports should be prepared; for it should always be borne in mind that the first duty of the Survey is to serve the public, which can be best done by publishing the results of the surveys as early as possible.

"I fear my paper will attain too great a length if I continue to point out so many defects in the Survey, but before closing, I would like to make a few suggestions which may be of some service to you. And first, I would suggest that, in view of what has come to light in the investigations carried on by your Committee, it would be a proper thing for your Committee to point out to the House the advisability of making some enquiry into the causes which have led to the resignation of so many members of the staff; with a view, if possible, of having some, or all, of these officers reinstated. They were all competent and well trained men, mostly diligent and enthusiastic in their work; and in nearly every case the resignations from the staff have been the cause of the loss to the public of valuable information for which it has paid, and which it has a right to receive or know the cause of its suppression. If some of the resigned members of the Survey could be reinstated without compromising the dignity of Parliament, or the discipline of the Service, certainly the public will be the gainer.

"Whatever the composition of the staff, the prime object should be to make the Department in the highest degree practical. Attention should be paid to the character of soils as well as to the occurrence of minerals, and the purely scientific aspect of geology should only be kept in view so long as it helps to throw light upon upon the more important practical and economic object of the Geological Survey. It would, no doubt, facilitate the work of the Survey if some separation could be made of topography from geology, and in this way the geologist could have more time to devote to his special work; but the only real advantage to be thus gained is the advantage of time.

"It is sometimes necessary to abandon a survey temporarily, though it may be important, to engage in one of still greater importance. Neglect of this has conduced greatly to the disgust felt by mining engineers for the Geological Survey, as the staff were employed in some work of no real practical importance at the time highly important work was requiring their attention. I have known many instances of this, and have wondered that the public stood it so long.

"It seems to me unwise for any portion of the grant to the Geological Survey to be spent in ethnological studies. These studies are no doubt attractive, and in some ways important, but they have no manner of connection with the practical geology at present required in Canada. The kind of pictures illustrating reports seems to me not to be in accord with the objects of the Survey, and if no illustrations of a purely geological nature can be made, it would be better to save the expense altogether and

not publish any. Useless maps, too, have been published; maps that have no sort of reference to geological matters or matters connected with any branch of natural history.

"In regard to the appropriation for the Survey, I would say that I consider it ample if carefully and economically expended. I consider most of the present members of the staff highly efficient men, but some of them are strangers to me, and of them I do not speak. I have not gone into any great detail in my criticisms or suggestions, though I am prepared to do so if you desire it. I will simply say, in conclusion, that from the time I first became acquainted thoroughly with the Geological Survey of Canada up to the present, I have felt the deepest regret that so important a branch of the Civil Service should be so grossly mismanaged; that greater and more important results were not obtained for the large outlay of money and the number of skilled men employed. And above all, so far as I was personally concerned, I felt keenly the great injury being done to the science of geology in allowing one of the best Surveys in the world to become so degraded; and I would desire strongly to impress upon you the fact that the investigations now being held by you are quite as much in the interests of the development of science as in the interests of the people of Canada. I regret that I have been unable to incur the expense of a trip to Ottawa to appear personally before you, for I am satisfied that this paper is not as full as it should be, and that I have not brought out sufficiently strong many important matters. Many of my general statements require illustrations of particular things to impress them on the mind, and in this paper I have not cared to enter into those matters; but I have no doubt that from a variety of sources you have been able to obtain all the information which I have failed to supply. Thanking you for the honour you have done me in asking for my views on the Geological Survey of Canada, and regretting that I have responded so imperfectly to your request,

"I am, dear Sir, very sincerely yours,

"WALLACE BROAD."

"ROBT. N. HALL, ESQ., M. P.,
"Chairman Select Committee House of Commons, Ottawa."

"GEOLOGICAL SURVEY OFFICE,
"DUBLIN, 4th April, 1884.

"SIR,—I have had the honour to receive your letter of the 18th of March, in which you ask for my opinion on three special points connected with the Geological and Mineral Surveys of the Dominion of Canada.

"First, As to the desirability of procuring and preserving mineral statistics. Upon this point I apprehend there can be no second opinion. The necessity for this was so urgently felt by our Governement, that in or about the year 1854 a special department was organized under the charge of Mr. Robert Hunt, F.R.S., for collecting returns of the production, export and import, of coals and other minerals for the United Kingdom. The returns have been annually published and have proved to be of the utmost value, as showing the progress of mining industry in the United Kingdom and as bearing on the question of our mineral resources, a question which at some future time may have to be seriously considered in reference to the Dominion of Canada itself. On this subject I would beg to refer you to my work on the coal fields of Great Britain, &c., 4th edition, 1881. Stanford, London.

"Second, As to the desirability of calling attention to the various minerals of economic interest, &c. As to the desirability, this must also be admitted, probably the question as to the mode in which this can done is the one of greatest importance. I am glad to know that in the Reports of Progress of the Canadian Geological Survey, the able Director, Doctor Selwyn, and his subordinates, give due attention to objects of economic value. If these reports are sufficiently circulated it becomes a question whether it is not more judicious for the State to leave to private enterprise the ques-

tions of the 'application, the extraction, and the treatment of the minerals themselves.' In my opinion this is so.

"Thirdly, Whether the work should be done in connection with the Geological Survey or by a separate and independent department. From what I have stated my reply would only bear upon the first of your questions. It seems to me desirable that there should be kept up a connection between any department for collecting mineral statistics and the Geological Survey, because the officers of the staff may have frequent opportunities of procuring such statistics and of forwarding them to the central office; at the same time, there should be one head of this department, who would be responsible directly to the Director of the Geological Survey and through him to the Government.

"I have the honour to be, Sir, your obedient servant,

"EDWARD HULL,

"*Director of the Geological Surveyor of Ireland.*"

"ROBERT N. HALL, Esq.,

"Chairman of Committee, House of Commons, Ottawa."

"UNITED STATES GEOLOGICAL SURVEY,

"WASHINGTON, D.C., 12th April, 1884.

"SIR,—I have the honor to acknowledge your favor of the 13th ult., in which you requested to be furnished a list of records of mineral statistics published by the United States Government, and in which other questions relating to the collection and publication of mineral statistics are propounded. In reply thereto I beg permission to make the following statement:

"The reports of the United States Mining Commissioners began in 1866 with that of Mr. J. Ross Browne. In 1868 Mr. Browne was succeeded by Dr. Rossiter W. Raymond, who continued the publication of this series till 1876, in which year the appropriation was withheld. These reports, however, were limited in scope to the territory west of the Rocky Mountains and to the subject of gold and silver mining, with merely incidental reference to the working of quicksilver, argentiferous lead and copper deposits.

"In 1876 a series of statistical and descriptive papers were prepared by the American Commissioners at the Centennial Exhibition in Philadelphia.

"In 1878 Mr. James D. Hague was appointed a Commissioner to visit the Paris Exposition, and he subsequently published a short report on foreign mining industries—his monograph being included in the 'Reports of the United States Commissioners at the Paris Exposition.'

"In 1880 Mr. Horatio C. Burchard, Director of the Mint, began the publication of annual reports on the production of gold and silver in the United States. These are dated for the callendar years 1880, 1881 and 1882. One will be published for 1883 also.

"At the Sensus of 1880 a detailed examination of the mines was attempted under the direction of officers of the Geological Survey. The final reports are still in press, but I take pleasure in sending you a bulletin on the production statistics, issued in 1881.

"In 1882 the Geological Survey was authorized by Congress to collect and publish statistics of mines other than those of gold and silver. I send you our first report, entitled, "The Mineral Resources of the United States," prepared by Mr. Albert Williams, jun. As this includes a short chapter on gold and silver, it is the first comprehensive exhibit of the kind issued by Government.

"Referring now to the questions with which your letter concludes, I have the honor to make the following suggestions:—

"'1. As to the desirability of procuring and preserving mineral statestics.'

"Many civilized nations have collected and published statistics of mines and mining, and the concensus of opinion expressed by statesmen, business men and publicists is that they are of direct and practical value. Simple statistics of production are much valued by merchants, manufacturers and miners; indeed the trades usually attempt the collection of such statistics through their organizations or representative journals, in cases where this is not done by Government. The knowledge of a country's mineral resources is of value to statesmen and to all who are interested in public affairs.

"2. 'As to the desirability of calling special attention to the various minerals of economic interest, their application, their extraction, and their treatment.'

"The value of mineral statistics is greatly increased if, in connection therewith, there be published such descriptive material as will give a knowledge of the existing state of the industries connected therewith, especially in regard to improvements in technical practice.

"The office through which the statistical reports are issued should serve as a bureau of information on subjects within its scope, to be freely accessible to citizens of the state for such matters as the determination of specimens, &c., and even for advice in cases which do not interfere with the interests of professional engineers, geologists and chemists.

"3. 'If desirable, whether the work should be done in connection with and as a subordinate department of the Geological Survey, or by a separate and independent department or bureau.'

"In reply to this question, I beg to express the opinion that the Geological Survey should be required to execute this trust, for the following reasons:

"(*a*.) It is to be assumed that the gentlemen most competent to perform this task are employed in the Geological Survey as professional experts; and the reputation of the corps of gentlemen engaged in the Geological Survey of the Dominion fully warrants this assumption.

"(*b*.) The work of a geological corps has for its prime economic object the exposition of the conditions under which the mineral wealth of a country may be utilized, and while prosecuting such investigation the additional work of preparing the mineral statistics could be carried on at a slight increased cost compared with that necessary to maintain an independent bureau.

(*c*.) The objections which statesmen may properly urge to the multiplication of official bureaux will be avoided thereby.

"I am, with great respect, your obedient servant,

"J. W. POWELL,
"*Director U. S. Geol. Survey.*"

"ROBERT N. HALL,
"Chairman Committee on Mining and Metallurgical Statistics,
"House of Commons, Ottawa, Canada."
(2 accompanying books.)

"UNIVERSITY OF THE STATE OF MISSOURI,
"COLUMBIA, MO., 12th April, 1884.

"SIR,—Owing to accidental neglect, I have delayed, perhaps, until it is too late, to give my expression with regard to rendering the Canadian Geological Survey more efficient. I am thoroughly conversant with the work of the Canadian Survey, being myself a Canadian, and having held a Chair of Geology in one of the Canadian Universities, until called here by greater inducements than my country afforded.

"In this State there have been organized several Surveys, of whose reports copies will probably be found in the Geological Library at Ottawa; if not, I may be able to procure copies for it.

"The United States, since 1866, has had several Geological Surveys organized for the Territories, but they are now all consolidated and form a bureau, not only of

the Territories, but of the States, which undertakes to investigate geological questions irrespective of the investigation of localities. One of the features of the Canadian Survey (with a few exceptions) during later years, has been to send parties exploring all over a vast territory, with the general omission of special work, which will stand the tests of time. In fact, most of the recent work (for the last dozen years) can be considered only as a reconnaisance, and it will be necessary to go over it again, and in this way the usefulness of the work falls far short of its character prior to 1870.

"One of the most prominent features of the United States Survey has been to investigate principles and publish *memoirs* which render our Survey famous throughout the world, but which the Canadian Survey, in recent years, almost entirely lacks. (Being a Canadian, I feel justified in my criticism). The manner in which the reports are published falls far short of their greatest utility.

"I would suggest that there should be a department of mining statistics, under the direction of an assistant director of the Survey, whose duties will embrace the collecting of information on mining and quarrying, and economic minerals generally, and that the reports shall refer to each Province separately.

"The Survey should publish full monographs on Canadian fossils, whether of old or new species. Also, it should lend aid to special writers, and publish their works free of cost, as has been done by the United States Survey, as many of these studies would cost too much for private enterprise. At the same time, this character of expenditure would be of great service to the scientific world, and elevate the character of the Survey.

"These remarks do not apply alone to fossils, but in the various explorations collections of minerals should be made, and monographs on various departments of natural history should be published.

"There should be published, from the various reports already made, final reports on various subjects in each Province. These reports should not be a compilation of the various reports, nor a synopsis of them, but full reports on various subjects, with the verbose utterances left out, as referring to each locality.

"Further, the Survey should have more field officers in proportion to the house or home officers, and that while some of them may be engaged in general explorations, others should be occupied in making complete surveys of those localities which demand most immediate attention, or in investigating special subjects.

"I have the honour to be, your obedient servant,

"ROBERT N. HALL, Esq., M.P., "J. W. SPENCER."
"Chairman of Committee of Investigation of Canadian Gological Survey."