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DOMINION OF CANADA

REPORT
OF THE
DEPARTMENT OF MINES

FOR THE
FISCAL YEAR ENDING MARCH 31, 1927

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DOMINION OF CANADA

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DEPARTMENT OF MINES

FOR THE

FISCAL YEAR ENDING MARCH 31, 1927



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REPORT

DEPARTMENT OF MINES

1914

FISCAL YEAR ENDING MARCH 31, 1914

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*To General His Excellency the Right Honourable Viscount Willingdon, G.C.S.I.,
G.C.M.G., G.C.I.E., G.B.E., Governor General and Commander in Chief
of the Dominion of Canada.*

MAY IT PLEASE YOUR EXCELLENCY:

The undersigned has the honour to lay before Your Excellency, in compliance with 6-7 Edward VII, chapter 29, section 18, the report of the work of the Department of Mines, for the fiscal year ending March 31, 1927.

CHARLES STEWART,
Minister of Mines.

The General has received the High Honorable Viscountess's letter of the 11th inst. in relation to the Government General and Government of the Province of ...

May it please your Excellency: The enclosed is the report to be made to the Government of the Province of ...

HALL'S STY WARE

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REPORT
OF THE
DEPARTMENT OF MINES

FOR THE FISCAL YEAR ENDING MARCH 31, 1927

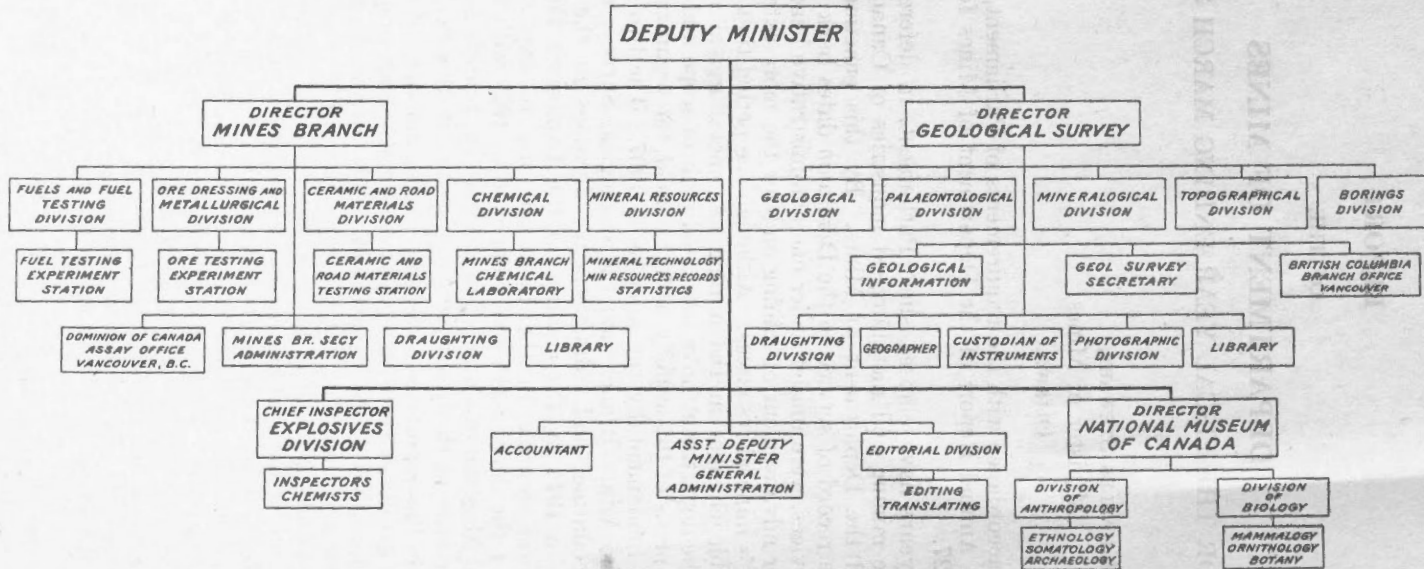
To the Hon. CHARLES STEWART,
Minister of Mines,
Ottawa.

SIR,—In accordance with the requirements of Parliament, I have the honour to submit the Annual Report of the Department of Mines for the year ending March 31, 1927.

Twenty years have elapsed since Parliament, in deference to the urgent request of the mining and metallurgical industries of Canada, passed the Act which created the Department of Mines. By this enactment the Geological Survey, whose record of service to the Dominion dates back to 1842, and other associated services, were united under one administrative head, to work together for the greater advancement of mining and for the more extensive development of the country's mineral resources. Although the period that has intervened has wrought notable changes in the mining and metallurgical industries, and the activities of the department have increased both in scope and in volume to keep pace with the needs of this rapidly widening field, the organization of the department remains fundamentally the same as in 1907. The two main services then constituted, the Mines Branch and the Geological Survey, with the necessary Editorial, Accounting, and Administrative divisions of the department, were supplemented in 1914 by the creation of the Explosives Division, established to ensure greater security in the increasing use of explosives. The formal organization of the department was completed in 1927 with the granting of the title "National Museum of Canada" to the museum branch, in recognition of the growing importance of the department's activities in this field.

Included in this report are statements of the functions of these branches and divisions with details of their operations during the year, prepared by the heads of each. All branches of the department report increased activities due to the constantly growing demand of the public for increased services. This condition would appear to be the result of a deeper appreciation of the value of technical and scientific research on problems related to the more efficient utilization of our mineral products, particularly if the Dominion is to maintain and improve its present position among the more important mineral-producing nations of the world and compete successfully with them in overseas markets. These growing demands can be met to a certain point only, beyond which increased facilities and a larger scientific force must necessarily be provided. This is especially evident in the case of the Mines Branch, where the point beyond which expansion cannot materially extend without the provision of increased facilities has already been reached. Although the annual appropriations by Parliament for these branches have not been augmented in recent years, it has been possible, by increasing the number of laboratory and field investigations and the number of technical papers and reports published on the mineral resources and mining

ORGANIZATION CHART
DEPARTMENT OF MINES



industries of the country, to enlarge the scope of their work and to extend its influence both within the Dominion and in other countries. An idea of the wide range and variety of the activities of the department may be obtained from the organization chart inserted at the beginning of this report.

During the year some seventy field parties were engaged in field investigations throughout the country. Field work in geology, topography, mineral resources, palaeontology, ethnology, biology, and botany was continued and in some cases new investigations were initiated: laboratory investigations embraced a wide range of subjects in the fields of chemistry, mineralogy and petrography, metallurgy, ore dressing, fuel testing, ceramics, and road materials. The type of investigations undertaken by the department differs distinctly from that generally carried out by other public or private organizations, and the danger of overlapping is thus almost entirely eliminated. Where similar work is undertaken, as in the case of some of the universities, provincial governments, and the National Research Council, every effort is made to co-ordinate the work of the department with that of these various bodies.

The same general policy of co-operation is maintained in respect to other departments of the Dominion and provincial governments, with the development branches of the railway companies, with chambers of commerce, and other Canadian organizations interested in the development of our natural resources. Very satisfactory results are also being secured from the active co-operation of the department with the Imperial Institute (London), the British Department of Scientific and Industrial Research, the Department of Commerce at Washington, and with certain technical societies in the United States. Assistance was also given during the year to the Advisory Board on Tariff and Taxation in regard to matters of a technical nature coming before it.

As an instance of the active co-operation maintained by the department with other agencies, a reference may be made to the conference held in Ottawa on March 1, 1927, at which the United States Bureau of Mines, the National Research Council of Canada, and the Department of Mines were represented, to discuss the beneficiation of iron ores and other mining and metallurgical problems of common interest to both countries. The beneficiation of iron ores is a question of great importance to Canada, and of increasing interest in the United States in view of the enormous drain that is being made upon the present large reserves of that country. Although high-grade ore is still available at a reasonable price, the time when the lower grades must be mined is approaching and methods for their treatment must be ready when the need arises. Close co-operation between the Canadian and United States Governments in the investigation and improvement of the known processes of beneficiation by a division of research work wherever feasible and by the pooling of technical information will result in increased efficiency and economy and greater advantage to the iron and steel industries of both countries. As a result of the conference an effort is now being made to lay out a definite program of investigations on which both governments may co-operate in accordance with their respective needs and the facilities at their disposal for research along those lines.

The system inaugurated in 1923 of dispatching official mining news letters for distribution in the United Kingdom and on the continent, from the High Commissioner's office in London, has been continued and expanded. These bi-monthly communications now reach some four hundred selected newspapers, mining and banking houses in Europe, and through this channel a rational and informed interest in Canadian mineral resources and mining operations is constantly sustained. The titles of the articles dispatched during the year are included among the list of papers and addresses appearing on page 7.

In addition to the summary reports, special bulletins, maps, and memoirs, containing the published results of all major investigations conducted by the

department in the field and in the laboratories, a great deal of information of scientific, technical, and current interest related to the activities of the Department is disseminated through the public and technical press and by means of addresses. In this work the department has continued to receive the valuable co-operation of the Natural Resources Intelligence Branch of the Interior Department. An idea of the extent to which this work is expanding may be gained from the list referred to above.

The educational lectures given annually during the winter months in the Lecture Hall of the Victoria Memorial Museum were again included in the department's museum activities, the scope of this year's series having been considerably enlarged. The gratifying attendance and keen interest shown in the subjects discussed, a list of which is given in the report of the Acting Director of the National Museum, indicates the increasing success and utility of this feature.

In addition to his duties relating to the administration of the department, the deputy minister continued to devote a considerable part of his time to other duties devolving upon him as chairman or member of the following official bodies: Council of the Northwest Territories, Dominion Fuel Board, Lignite Utilization Board, Canadian Committee of the World Power Conference, Advisory Committee on Mining Regulations, National Research Council, Niagara Board, Advisory Committee on Minerals of the Imperial Institute. Meetings of each of these bodies were held throughout the year, though participation in the last mentioned was by correspondence only.

A new record for Canadian mining industries was established during the year, when production reached a total of \$241,245,898; an increase of more than \$13,000,000 over the previous high record of 1920, notwithstanding the fact that the level of metal prices was 35 per cent higher in that year than in 1926. There are few instances where production in 1926 did not surpass the corresponding totals for preceding years, and notable advances were made in the production of copper, gold, silver, lead, and zinc among the metals and in that of coal, feldspar, gypsum, graphite, natural gas, petroleum, pyrites, quartz, and salt among the non-metals. The annual output of structural materials also showed an appreciable gain during the year.

The large and widespread importance attained in recent years by mining in the Dominion has brought it into prominence as one of the first-rank factors in the economic life of the country. For years mining was an activity of major importance to but two or three provinces. Its present standing, instead of being of provincial concern only, is a matter of Dominion-wide importance, and in a very real way the Canadian mining industry may be said to have taken on an entirely new status. It is reasonably safe to say that this changed outlook is due, not only to the remarkable developments already made in the mineral industries, but also to the strong conviction that mineral resources are likely to play a part of even greater importance in national development in the future.

When speaking of the general progress of the Dominion as a mining country a reference may first be made to the rapid rise in mineral production. During the period of forty years since 1886, when comprehensive statistics on this subject were first compiled, the value of the annual production increased by more than \$230,000,000, and the per capita average has risen in the same period from \$2.23 to \$25.69. During this time the aggregate value of Canada's mineral output reached the impressive figure of \$4,013,518,027. A second notable feature is the diversity of lines along which Canadian mining has advanced. Some fifty different minerals, metallic and non-metallic, are listed in the production figures for 1926, and this number includes a variety such as nickel, cobalt, asbestos, gold, lead, silver, copper, and zinc, in which Canada either leads world production or ranks among the greater producing nations. A

number of different metals are produced today each of which alone contributed to the mineral production of 1926 a sum greater than the value of the entire metallic output of the Dominion forty years ago. With the exception of one or two important products, the absence of which from the list is noticeable, Canada's range of mineral output is probably not excelled in variety by that of any other country.

Of great importance to the Dominion as a whole is the fact that mining is spreading over a vastly greater territory than formerly, and that nearly every province is now sharing strongly in mineral production, or in the earlier stages of new mining development. This expansion has probably been the most potent factor among those that have contributed in lifting the industry to its new level of importance, as it has demonstrated the wide extent of Canada's mineralized regions and has revised the whole estimate of the value of the country's northerly areas. Most significant, perhaps, of all, it has created throughout the Dominion an active, well-informed interest in mining, and has commanded for mining and metallurgical enterprise a breadth and strength of support quite beyond anything possible a few years ago.

In addition to the extent of Canada's physical field for further mineral development, which in itself furnishes a reasonable basis for confidence in the growth of Canadian mining, there are a number of other factors that have a vital bearing upon the outlook. Great technical advances have been made in prospecting methods and in mining and metallurgical practice, and Canada is now better equipped in personnel for advancing in mining development. The intelligent interest aroused throughout the country in recent years is a force in itself, and as a result of the close relations existing between the universities, government departments, and the mining industry, the Dominion is gradually being better equipped with engineers, geologists, metallurgists, and other technical staffs. Through field and laboratory investigations and in other ways both federal and provincial governments are assisting in the work of mineral development. Moreover, the railway companies, banks, and other business interests have become deeply impressed with the importance of mining and are giving it a measure of attention already great and likely to increase as development continues. It may, therefore, be said that there is behind the Canadian mining industry a strength of support which leaves little likelihood that the industry will fail to advance through any lack of competent business or technical backing.

Dominion Fuel Board

The Dominion Fuel Board was engaged with a continuation of investigations and studies relating to fuel problems and co-ordination of results of previous investigations.

In important work completed during the year was a joint investigation by the Fuel Testing Division of the Mines Branch, and the Fuel Board, to determine the relative heating efficiency of Canadian and British coals, and the various kinds of coke. This investigation has enabled the compilation of a complete report on the subject.

The board also arranged for a series of pamphlets stressing the advantages to be derived from better methods of construction and insulation of houses. It has been arranged to include in this series of pamphlets subject matter which will point out economy in the fuel bill and additional comforts obtained by application of the principles recommended.

An investigation previously initiated was one relating to the use of wood as an auxiliary fuel in Ontario. Although the field survey in connexion with the investigation has been completed, the board is devoting further study to the subject before publishing a report.

Evidence relating to Canada's fuel problems was given by members of the board at the hearings of the Special Committee of the House of Commons investigating coal resources of Canada. The board also submitted reports covering a number of individual phases of the coal situation, for the information of the committee.

The secretary's office carried out the annual survey of fuels used to replace anthracite in the central provinces. The report on the survey indicated a notable increase in the use of domestic coke and other so-called "substitute fuels" in the acute fuel area. A marked improvement in the domestic fuel situation is steadily progressing.

In connexion with the federal legislation enacted to encourage the production of domestic fuel from coal mined in Canada, the work of draughting the Act and regulations for administration thereof was assigned to the Fuel Board. Other data for parliamentary use were also submitted by the board, during the session of Parliament.

Reports published in former years, such as those relating to the use of coke as a household fuel, and to central and district heating, continue to be in demand, many copies of both the English and French editions being distributed to interested parties. There was a keen demand during the year for instructions, as published by the board, on "How to Burn Coke."

The co-operation of the Natural Resources Intelligence Service, the Mines Branch, Geological Survey, and the Dominion Water Power and Reclamation Service was freely extended to the Fuel Board throughout the year.

Information relative to fuel matters was supplied by the board to different branches of the government service, and a large number of requests from the public for information of a similar nature were dealt with during the period under review.

An outstanding feature in the process of improving the domestic fuel situation was the increased use of by-product coke as a household fuel. Owing to the coal miners strike in Great Britain, importations of British anthracite were considerably retarded.

Your obedient servant,

CHARLES CAMSELL,
Deputy Minister.

OTTAWA, November 16, 1927.

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- Indian Designs in Batik, by D. Leechman. Canadian Homes and Gardens, December, 1926.
- Ceinture Fléchée, by D. Leechman. Ibid., January, 1927.
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- Kitchen-Middens of the Pacific Coast of Canada, by H. I. Smith. Read at Pan-Pacific Congress, Tokio, October, 1926.
- Folk-Songs of French Canada, by C. M. Barbeau. Toronto Art Gallery, May 13, 1926; Women's Press Club, March 22, 1927.
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GEOLOGICAL SURVEY

W. H. Collins, Director

CHANGES IN ORGANIZATION AND STAFF

Some consolidation was effected in the Draughting Division this year by promoting C.-O. Senécal from chief map draughtsman to geographer, promoting Alexander Dickison from supervisor of map preparation and reproduction to chief map draughtsman, and abolishing the position thus vacated. The change permits of closer correlation of the various phases of map preparation.

Resignations were received from M. F. Connor, chemist; L. Y. Clarke, senior photographer; A. P. Dowling, engineering clerk; and S. K. MacDonald, museum helper. R. J. C. Fabry was appointed in place of Mr. Connor, and E. Proulx instead of Mr. MacDonald. The position occupied by Mr. Clarke was changed to process worker and efforts are being made to obtain a suitable occupant. Mr. Dowling's position was changed to lapidary, and given to William Allingham, who, however, will not assume his duties until early in the next fiscal year. Miss T. A. Egan, stenographer, grade II, in the Division of Palæontology, was transferred to the Departmental Accountant's Branch and the position vacated filled by the promotion of Miss A. E. Stafford, from the Departmental Administrative Division. The staff of the Borings Division, which has now to cope with great quantities of material from the Prairie Provinces, in consequence of the feverish search for petroleum, was augmented by the appointment of F. J. Fraser, junior engineer.

By the death of Alexander Young, senior clerk, on August 2, 1926, the Survey lost an employee who had served conscientiously for nearly twenty years and had gained in that time a knowledge of his duties in dealing with requests for publications that cannot easily be acquired by a successor.

CHANGES IN PUBLICATIONS

The Geological Survey has, since 1842, issued reports and maps on the geography, geology, and mineral deposits of Canada, and on a diversity of other subjects relating to the natural history and natural resources of this country. A complete set of the reports now occupies 26 feet of bookshelves, and there are nearly a thousand maps. A series of indexes has been compiled to facilitate reference to this valuable, but bulky, literature; but, even with this aid, it is becoming increasingly difficult for the professional scientist, and much more for the lay reader, to extract information on any particular subject. Written by a great many different persons over a period of eighty-five years, repetition of information, and contradiction and modification of statement have been unavoidable, and these, naturally, increase the difficulties of a present-day reader.

To overcome these disadvantages, so far as information on the mineral wealth of the country is concerned, there has been inaugurated an Economic Geology Series of reports, each of which is intended to summarize existing information about a particular mineral or group of minerals in older Survey reports and other sources of information, supplemented by such field study as may be needed to bring information on the subject to date. These reports have the further and still more important object of drawing from the available information useful generalizations and deductions regarding the genesis, modes of occurrence, distribution, and location of new supplies of ore deposits. It is anticipated that, by restricting the series to a limited number of topics and by issuing new and revised

editions of each report as increase of information may require, the series will be kept within comparatively small bulk and number. Already three of these reports have been issued—one dealing with talc and soapstone, another with iron ores, and another comprehensively reviewing the economic geology of Canada. Several others are in press or being written.

A corresponding consolidation of information is being made for maps. As long ago as 1862 Sir William Logan, first Director of the Geological Survey, compiled a geological map of Canada that contained as much information as could be expressed on the scale used, 125 miles to the inch. Since then a scale of 100 miles to the inch has been adopted and the third edition on this scale was published in 1925. A series of regional sheets, mostly on the scale of 8 miles to the inch and intended ultimately to cover the whole country, is also being published as opportunity permits. Maps 39A, 155A, and 160A are examples of this class, and three others are now in course of preparation. Each summarizes in considerable detail what is known of an area of from 25,000 to 75,000 square miles. Besides these regional sheets, as many as possible of still more detailed maps are being issued on a uniform scale of 1 inch to 1 mile, in units that represent 15 minutes of latitude by 30 minutes of longitude. These standard sheets constitute the basis for the regional sheets and for all special maps on scales of 1 inch or less, to the mile. Separate topographical and geologically coloured editions are issued. They fit together without overlaps or gaps, can be revised without waste of effort, and, being uniform with the standard maps issued by the Departments of the Interior and National Defence, greatly facilitate interchanges.

AIRPLANE SURVEY WORK

Ever since its organization the operations of the Geological Survey have been restricted by lack of good base maps. Perforce, a large share of the energy of the Geological Survey has been devoted to geographical and topographical surveying and map-making. The greater part of what is known about the geography of Canada, especially of northern Canada, has been obtained by this Department, but at the sacrifice of geological investigation. Of late years this lack of base maps has been diminished by the work of the Departments of National Defence and the Interior, and especially within the last year or two by the application of airplane photography to map-making.

Some assistance had been given the Geological Survey by the Royal Canadian Air Force as early as 1923. During 1926, however, a far more important service was rendered by the vertical photography of an area of nearly 4,000 square miles in Rouyn mineral district, Quebec. The photographs, which were taken by the Royal Canadian Air Force, are being used jointly by the Geological Survey, Department of Mines, and the Topographical Survey Branch, Department of the Interior, for the preparation of maps richer in geographical detail than would be obtainable by ordinary ground survey methods. The photographs also permit of a more accurate delimitation of rocky, and of drift-covered, areas, a distinction of much value to prospectors. The brief experience that the Geological Survey has had with aerial photographs demonstrates that, in certain cases, geological information can be obtained that would be difficult and costly to secure by other methods, and it seems probable that, with increasing experience, geologists will benefit to a greater extent from these pictures.

FIELD WORK

Fifty-three field parties were sent to different parts of Canada during the season of 1926. Forty of these were engaged in geological work, twelve in topographical surveying, and one in collecting fossil remains of dinosaurs and other vertebrate animals for the National Museum. A short account of the work of each of these parties follows.

GEOLOGICAL DIVISION

G. A. Young, Chief Geologist, reports:

Yukon

W. E. Cockfield explored geologically and geographically a large area near Aishihik lake that includes a part of the eastern edge of the Coast Range batholith in southwestern Yukon. The relation of the batholithic body to ore deposits in Yukon and British Columbia has long been recognized. The field work in 1926 completed the mapping of all the more easily accessible parts of the eastern margin of the batholith in Yukon. A map and report representing the season's field work appear in Summary Report, 1926, part A.

British Columbia

F. A. Kerr commenced topographical and geological mapping of a strip of country along Stikine river from Telegraph Creek south to the International Boundary. This district borders the Coast Range batholith on the east and is known to hold mineral deposits of some value. A report on the season's work, with an account of certain of the mineral deposits, is included in Summary Report, 1926, part A.

George Hanson commenced detailed geological work in Bear River area, Portland Canal district. The area holds many mineral deposits and minor operations, chiefly for silver, lead, and zinc, but with possibilities of gold and copper, have been carried on for a number of years.

J. R. Marshall examined geologically an area along the eastern edge of the Coast Range batholith, south from Copper City on Skeena river. Some mineral deposits occur within the area. A report on the area, accompanied by a map, is incorporated in Summary Report, 1926, part A.

Victor Dolmage completed a detailed examination of the geology and copper ore deposits near Allenby. This work was commenced in 1923, but not continued until 1926. A report, accompanied by a map and detailed plans and sections, is now nearing completion. Mr. Dolmage also examined the Rock Candy fluorite deposit north of Grand Forks.

C. H. Crickmay continued from 1924 a geological survey of the vicinity of Harrison lake. This locality contains an unusually complete succession of Palæozoic and Mesozoic strata and affords a correspondingly good opportunity for obtaining information about the geological history of the Coast region of British Columbia. A report upon this work will require considerable time for completion.

H. S. Bostock made a detailed investigation of the Nickel Plate gold-arsenic mine and neighbouring prospects in the vicinity of Hedley. By taking advantage of the extensive underground workings much new information has been obtained which should be of direct aid in prospecting for new ore-bodies in the mine and in the district in general. The field of work is to be enlarged in 1927, after which a map and report will be completed.

C. E. Cairnes continued the systematic survey of the geology and ore deposits of Slocan mining area, which he began in 1925. The Slocan has long been famous for its rich silver-lead ores. More recently their important zinc content has furnished further incentive for their development. The investigation will be continued and probably completed in 1927. Mr. Cairnes also examined an antimony deposit at the head of Kane (north fork of Carpenter) creek, Slocan Mining division. An account of this occurrence, the most important of its kind in the province, is given in Summary Report 1926, part A.

J. F. Walker and M. F. Bancroft nearly completed the study of the geology and mineral resources of Lardeau area. A correct understanding of the geology of this difficult area is of fundamental importance. The mineral deposits are numerous and have attracted much attention. Some further field work will be done in 1927 before a report and map are published.

C. S. Evans completed detailed geological mapping of the territory bordering Columbia River valley from Windermere area north to beyond Golden. Mr. Evans contributes to the Summary Report 1926, part A, an account of certain placer gold and lead-zinc deposits in the Dogtooth range.

F. J. Alcock, in the course of a systematic investigation of the lead and zinc ores of Canada, studied various properties in the following districts: the vicinity of Smithers; Portland Canal district; the coast from Vancouver north to Lund; Slocan district; Kimberley area; Windermere area; and near Field. Descriptions of these and other British Columbia properties will appear in a memoir dealing with the lead and zinc deposits of Canada.

Alberta and Saskatchewan

G. S. Hume studied the stratigraphy and structure of the Turner Valley oil- and gas-field. The information gained will be presented on a new edition of the map of the field. A preliminary map and report appear in Summary Report, 1926, part B. Mr. Hume also extended his investigations into adjoining areas.

W. S. Dyer and M. Y. Williams, working separately, completed the re-survey of the geology and mineral resources of an area in southern Alberta and adjacent parts of Saskatchewan extending from the International Boundary to latitude 52 degrees and eastward to longitude 109 degrees. A report on this work, and a map showing the areal distribution and structure of the strata, are now being prepared and should be of much service in the development of supplies of coal, natural gas, petroleum, etc. Mr. Dyer, in the course of his work, discovered an area in Cypress hills, the geological structure of which seems to be favourable for accumulation of gas or petroleum, or both. A full account of this discovery is contained in Summary Report, 1926, part B. Mr. Dyer also investigated the oil and gas prospects of a considerable area in southern Saskatchewan, in Big Muddy Lake region, and has given an account of this work in Summary Report 1926, part B.

B. R. MacKay completed a detailed geological survey, begun in 1924, of the coal measures and associated strata in the general vicinity of Mountain park, western Alberta. A series of maps presenting the results of the work are in course of preparation.

P. S. Warren geologically surveyed a large area east of North Saskatchewan river and north from North Battleford. Mr. Warren also investigated the possibilities of oil and gas in the vicinity of Riverhurst, Saskatchewan, and gives an account of this investigation in Summary Report 1926, part B.

Manitoba

W. A. Johnston studied and mapped the Pleistocene and Recent deposits (soils) of an area covering a considerable part of southern Manitoba. The work is required as a basis for soil and agricultural studies being prosecuted by Federal and Provincial organizations and includes the investigation of road materials, clays, and other non-metallic substances of economic value. The results will appear partly in the form of maps, several of which are now in process of publication.

J. F. Wright completed the geological and geographical survey of Beresford-Rice Lake district. Important mining developments are taking place in this area. A map and report dealing with the geology and mineral resources are being prepared.

C. H. Stockwell commenced an investigation of the lithia-bearing pegmatites and associated rocks north and south of Winnipeg river.

Ontario

T. L. Tanton continued the detailed geological and geographical survey of an area of 400 square miles in the vicinity of Steeprock lake, Rainy River district. The area contains several types of mineral deposits and is important for the understanding of the general geology of the region west of lake Superior.

H. M. Bannerman commenced the detailed examination and mapping of pyritiferous iron formations in the vicinity of Nickel lake and of Furlonge lake, Rainy River district.

E. Thomson completed the geological and geographical mapping of Woman River and Ridout quadrangles in which occur iron formation, pyrite, small gold-bearing veins, and occurrences of galena and zinc blende. A memoir, to be accompanied by a map of each quadrangle, is in course of preparation.

R. C. Emmons geologically and geographically surveyed an area in the vicinity of Wakomata lake, north of lake Huron. A map and report on the work will be published in Summary Report 1926, part C.

W. H. Collins continued geographical and geological mapping of Espanola quadrangle, an area of about 400 square miles immediately west of the Sudbury nickel basin. The area is important not only for the general understanding of Precambrian geology in northeastern Ontario, but also for the solution of various geological problems encountered in the nickel basin.

C. Tolman, in the same area, mapped and studied the Birch Lake granite, a large intrusion of late Precambrian (Killarnean) age, not hitherto distinguished from the pre-Huronian granites. Further work will be done in 1927.

T. T. Quirke continued the detailed geological survey and investigation of the mineral resources, particularly of non-metallic materials such as feldspar, silica, and building stones, of an area along the north coast of Georgian bay in the vicinity of the mouth of French river and westward.

R. H. Pegrum made a detailed study of the nepheline syenites and related intrusives in the vicinity of French river.

F. H. McLearn studied the Mesozoic formations and associated coal deposits that outcrop along Mattagami and Missinaibi rivers north of the Canadian National railway. The coal deposits have attracted increased attention lately as a possible fuel supply for Ontario. A full report upon this work appears in the Summary Report for 1926, part C.

Quebec

H. C. Cooke revised the geology and further investigated the mineral deposits of part of Rouyn district, western Quebec. A report dealing with the origin of the copper-bearing deposits and a map of part of the field investigated appear in Summary Report 1926, part C. The main results of the field work will be published in the form of a revised edition of the already issued, standard map-sheets and in a report dealing with the general region.

W. F. James and J. B. Mawdsley continued the detailed geological examination of the eastern extension of the Rouyn mineral belt. The study of the Dubuisson and Fiedmont quadrangles was completed. A report on various mineral properties within this area appears in Summary Report 1926, part C.

B. S. W. Buffam completed a geological survey of the Abitibi East and Taschereau quadrangles, which extend eastward from Abitibi lake.

J. W. Goldthwait completed a study of the physical features and geological history of the lowlands bordering St. Lawrence river which he began in 1925. An account of this work is being prepared and will be written, so far as possible, not only for the benefit of scientists, but in non-technical language for the benefit of visitors and residents in St. Lawrence valley.

A. Anrep surveyed peat bogs in the vicinity of Chicoutimi and Lacolle. A report on these deposits, accompanied by plans, appears in Summary Report 1926, part C.

W. V. Howard completed the geological mapping of Escuminac quadrangle, bordering Chaleur bay near Carleton.

New Brunswick

A. O. Hayes continued geological mapping of an area of about 400 square miles extending east and northeast of St. John.

V. Auer investigated various peat bogs in New Brunswick and Nova Scotia. Mr. Auer has specialized in the study of peat deposits in Finland. His work in Canada was for the purpose of ascertaining the conditions under which peat bogs have originated in Canada, of classifying them, determining their economic values, and of comparing American with European peat deposits.

M. E. Wilson visited various mineral deposits in the province. The results of this work appear in Summary Report 1926, part C.

Nova Scotia

T. G. Guernsey geologically surveyed an area, including North mountain, bordering West bay, Bras d'Or lake, Inverness county. A report on this work, accompanied by a geological map, is being prepared. Mr. Guernsey also examined a deposit of quartz sand in the valley of Diogenes brook near Melford. An account of this deposit, illustrated by a plan, appears in Summary Report 1926, part C.

M. E. Wilson examined various gold-bearing, lead-zinc, and other deposits in Nova Scotia. The results of these investigations are published in Summary Report 1926, part C.

North West Territories

L. J. Weeks, with his assistant M. Haycock, accompanied the C.G.S. *Arctic* on her annual cruise to the Arctic islands. He is to winter on Baffin island in order to conduct a general exploration of the geography, geology, mineral resources, etc., of the southern part of that island.

TOPOGRAPHICAL DIVISION

W. H. Boyd, Chief Topographical Engineer, reports:

The Topographical Division makes topographical and geographical maps to meet the requirements of the Geological Survey. At the same time these maps are made to such standards that they meet general requirements for mining development, engineering and industrial operations, and are contributory to the systematic mapping of Canada. A wide range of ground survey and control methods may enter into the making of these maps, which are made in all parts of Canada and on scales ranging from 1 inch to 400 feet, to 1 inch to 10 miles.

FIELD WORK

During the year topographical and geographical surveys were carried out in Alberta, Ontario, Quebec, and Nova Scotia.

Alberta

A. C. T. Sheppard completed a detailed topographical map of the coal-bearing area near the town of Brûlé Mines. This map is on a field scale of 1 inch to 800 feet with contour interval of 50 feet, and covers an area of approximately 6 square miles.

Mr. Sheppard also completed the revision of Turner Valley quadrangle, latitudes $50^{\circ} 30'$ to $50^{\circ} 45'$, longitudes $114^{\circ} 00'$ to $114^{\circ} 30'$. This work is for publication on the scale of 1 inch to 1 mile. The contour interval was changed from 20 to 25 feet. He also visited the parties working under the direction of J. W. Spence and J. A. Macdonald for purposes of supervision and co-ordination.

D. A. Nichols began topographical mapping of Jumping Pound quadrangle, east half, latitude $51^{\circ} 00'$ to $51^{\circ} 15'$, longitudes $114^{\circ} 30'$ to $114^{\circ} 45'$. This work is for publication at 1 inch to 1 mile with contour interval of 25 feet. About one-half this area was completed.

This area, together with that to the south, where J. A. Macdonald was working, and Turner Valley quadrangle, are being prospected for oil.

J. A. Macdonald carried out the topographical mapping of Elbow quadrangle, east half, latitudes $50^{\circ} 45'$ to $51^{\circ} 00'$, longitudes $114^{\circ} 30'$ to $114^{\circ} 45'$. This map is for publication at 1 inch to 1 mile with contour interval of 100 feet, and is about one-half completed.

J. W. Spence completed topographical mapping of the west half of Lovett quadrangle, latitudes $53^{\circ} 00'$ to $53^{\circ} 15'$, longitudes $116^{\circ} 30'$ to $117^{\circ} 00'$. In order to cover the coal-bearing area he also mapped parts of the east half of Lovett quadrangle, Brazeau quadrangle, latitudes $52^{\circ} 45'$ to $53^{\circ} 00'$, longitudes $116^{\circ} 30'$ to $117^{\circ} 00'$, and of the east half of Cadomin quadrangle, latitudes $53^{\circ} 00'$ to $53^{\circ} 15'$, longitudes $117^{\circ} 00'$ to $117^{\circ} 30'$. This work is all phototopographical, for publication on a scale of 1 inch to 1 mile, contour interval 100 feet.

Ontario

A. G. Haultain completed the geographical control surveys for Collins Inlet quadrangle, latitudes $45^{\circ} 45'$ to $46^{\circ} 00'$, longitudes $81^{\circ} 00'$ to $81^{\circ} 30'$; and Panache quadrangle, latitudes $46^{\circ} 00'$ to $46^{\circ} 15'$, longitudes $81^{\circ} 00'$ to $81^{\circ} 30'$. Geographical control surveys were continued in Key Harbour quadrangle, latitudes $45^{\circ} 45'$ to $46^{\circ} 00'$, longitudes $80^{\circ} 30'$ to $81^{\circ} 00'$; and French River quadrangle, latitudes $46^{\circ} 00'$ to $46^{\circ} 15'$, longitudes $80^{\circ} 30'$ to $81^{\circ} 00'$. Triangulation and transit control surveys were carried on for Espanola quadrangle, latitudes $46^{\circ} 15'$ to $46^{\circ} 30'$, longitudes $81^{\circ} 30'$ to $82^{\circ} 00'$. All this work is for the control of map-sheets that are being prepared in connexion with geological investigations.

R. C. McDonald carried out geographical control surveys for Steeprock quadrangle, latitudes $48^{\circ} 45'$ to $49^{\circ} 00'$, longitudes $91^{\circ} 30'$ to $92^{\circ} 00'$. A primary control traverse along the Canadian Pacific railway from Kenogama station eastward to the northwest corner of the township of Cavell was also carried out for control of geographic and other surveys in Woman River and Ridout quadrangles, latitudes $47^{\circ} 30'$ to $47^{\circ} 45'$, longitudes $83^{\circ} 00'$ to $83^{\circ} 30'$.

Quebec

S. C. McLean carried out a primary control traverse along the Canadian Northern railway from the Ontario-Quebec boundary line eastward to Megiscane station. This work is referred to the Amos astronomical station and forms primary mapping control for township lines and other secondary control. This work forms a basis of control for several map-sheets embracing Rouyn district.

S. M. Steeves, junior topographical engineer, was attached to this party.

R. Bartlett carried out geographical control surveys for the Dubuisson sheet, latitudes $48^{\circ} 00'$ to $48^{\circ} 15'$, longitudes $77^{\circ} 30'$ to $78^{\circ} 00'$; the Duparquet sheet, latitudes $48^{\circ} 15'$ to $48^{\circ} 30'$, longitude $79^{\circ} 00'$ westward to the Ontario-Quebec boundary line; and the Opasatika sheet, latitudes $48^{\circ} 00'$ to $48^{\circ} 15'$, longitude $79^{\circ} 00'$ westward to the Ontario-Quebec boundary line. These surveys were for control of map-sheets being prepared to show the geology of Rouyn district.

Co-operation with the Topographical Surveys, Department of the Interior, in the use of aerial photographs, is being maintained throughout all the map work in this region.

H. N. Spence mapped geographically Carleton quadrangle, Bonaventure county, latitudes $48^{\circ} 00'$ to $48^{\circ} 15'$, longitudes $66^{\circ} 00'$ to $66^{\circ} 30'$. All drainage and shorelines and all artificial features such as roads, trails, railroads, township lines, buildings, etc., were surveyed. This area includes a portion of New Brunswick in the vicinity of Dalhousie. About one-half the sheet was completed.

Nova Scotia

K. G. Chipman carried out transit and tape control for an area previously mapped in detail by E. R. Faribault in the vicinity of the Nictaux-Torbrook iron mines. An area in the vicinity of Springhill was revised and the topography mapped in greater detail.

Mr. Chipman also visited the parties working under the direction of J. V. Butterworth and H. N. Spence, for purposes of supervision and co-ordination of work.

S. C. McLean carried out the primary control traverse for the Lockeport sheet, N.S. This control is for future topographical work in this area. S. M. Steeves, junior topographical engineer, was attached to this party.

W. H. Miller completed the Springhill quadrangle, latitudes $45^{\circ} 30'$ to $45^{\circ} 45'$, longitudes $64^{\circ} 00'$ to $64^{\circ} 30'$. He also completed more than one-half the Oxford quadrangle, west half, latitudes $45^{\circ} 30'$ to $45^{\circ} 45'$, longitudes $63^{\circ} 45'$ to $64^{\circ} 00'$. This quadrangle lies immediately to the east of the Springhill quadrangle.

J. V. Butterworth continued geographical mapping in Digby county, along the bay of Fundy. The Digby sheet, latitudes $44^{\circ} 30'$ to $44^{\circ} 45'$, longitudes $65^{\circ} 30'$ to $66^{\circ} 00'$, was completed and a start made on the Belliveau sheet, latitudes $44^{\circ} 15'$ to $44^{\circ} 30'$, longitudes $66^{\circ} 00'$ to $66^{\circ} 30'$.

OFFICE WORK

The following map work was completed during the year:

Province	Map-sheet	Latitude and longitude	Scale
British Columbia	Slocan, west half	49° 45' to 50° 00' 117° 15' to 117° 30'	1 inch to 1 mile
	Cranbrook, west half	49° 30' to 49° 45' 115° 45' to 116° 00'	1 inch to 1 mile
	Stewart, west half	55° 45' to 56° 00' 129° 45' to 130° 00'	1 inch to 1 mile
	American creek, west half	56° 00' to 56° 15' 129° 45' to 130° 00'	1 inch to 1 mile
Alberta	Brûlé (detail)		1 inch to 800 feet
	Cadomin	53° 00' to 53° 15' 117° 00' to 117° 30'	1 inch to 1 mile
	Mountain park	52° 45' to 53° 00' 117° 00' to 117° 30'	1 inch to 1 mile
	Brazeau	52° 45' to 53° 00' 116° 30' to 117° 00'	1 inch to 1 mile
	Lovett	53° 00' to 53° 15' 116° 30' to 117° 00'	1 inch to 1 mile
Manitoba	Oxford and Knee lakes	54° 40' to 55° 10' 94° 20' to 96° 00'	1 inch to 2 miles
	Bigstone and Fox rivers		1 inch to 1 mile
Ontario	Parache	46° 00' to 46° 15' 81° 00' to 81° 30'	1 inch to 1 mile
	Collins inlet	45° 45' to 46° 00' 81° 00' to 81° 30'	1 inch to 1 mile
Quebec	La Motte	48° 15' to 48° 30' 78° 00' to 78° 30'	1 inch to 1 mile
	Fiedmont	48° 15' to 48° 30' 77° 30' to 78° 00'	1 inch to 1 mile
	Dubuisson	48° 00' to 48° 15' 77° 30' to 78° 00'	1 inch to 1 mile
Nova Scotia	Margaretville	45° 00' to 45° 15' 65° 00' to 65° 30'	1 inch to 1 mile
	Bridgetown	44° 45' to 45° 00' 65° 00' to 65° 30'	1 inch to 1 mile
	Springhill	45° 30' to 45° 45' 64° 00' to 64° 30'	1 inch to 1 mile

Computations of the geographical positions of the permanent marks established along the Canadian National railway in Quebec have been completed. Lists of these permanent marks with descriptions of their locations and geographical positions are available on request to the Director.

D. A. Nichols continued the physiographic work. New slides have been added to the library collection and illustrations, with descriptions, of Canadian physiography, have been sent out to various universities.

MINERALOGICAL DIVISION

Eugene Poitevin, Chief of the Division, reports:

During the fiscal year just ended Miss Florence H. B. Richardson was promoted from clerk-stenographer to museum assistant; Thos. Houlihan, museum helper, was transferred to the general staff of the Geological Survey; M. F. Connor, chemist, resigned and R. J. C. Fabry was appointed in his place; and Dr. W. F. Ferrier was engaged in special museum work from January until the end of June, 1926.

LABORATORY AND OFFICE WORK

The number of visitors seeking mineral determinations or information regarding the mineral industry was unusually high this year, and about 15 per cent of the working time of the staff was thus occupied. In addition to several reports-dealing with investigations for members of the staff of the Department of Mines, the Chief of the Division made 302 reports on mineral specimens received by mail from various parts of Canada. These reports were issued as follows:

Alberta.....	8	Ontario.....	94
British Columbia.....	20	Quebec.....	99
Manitoba.....	18	Prince Edward Island.....	2
New Brunswick.....	31	Saskatchewan.....	4
Nova Scotia.....	25		

The Chief of the Division also studied and prepared articles upon several interesting occurrences of minerals in Canada.

H. V. Ellsworth continued his work on the rare earth minerals of Canada. Preliminary articles on some of his results were printed in the *American Mineralogist*, and a list of these is given on page 7. He also determined 427 mineral specimens and supplied over 71 reports to prospectors and others.

Mr. Fabry joined the division in February and has been occupied chiefly in renovating his laboratory and preparing for analytical work.

MUSEUM WORK

Plans for the future mineral halls of the National Museum have been prepared and a progressive policy has been started to execute these plans. Cases for the systematic collection are being built according to the model completed last year and an exhibit of ornamental stones has been arranged in one of them. The economic exhibit has been enlarged by several exhibits of gold and silver ores, rare earths, and other minerals. The systematic collection of Canadian and foreign minerals has been enriched by over 200 mineral species from England, France, Norway, Sweden, Germany, Belgian-Congo, Russian Turkestan, etc. This collection was obtained partly through purchase and partly by exchange.

EDUCATIONAL COLLECTIONS

A. T. McKinnon assembled 264 collections which were distributed throughout Canada, an increase of 153 over last year.

These collections were distributed as follows:

Province	Standard	Grade II	Grade III	Miscellaneous	Mineral chips	Prospectors	Kegs
British Columbia.....	1	0	1	1	0	11	0
Alberta.....	1	0	0	0	1	1	0
Saskatchewan.....	2	0	0	3	1	1	1
Manitoba.....	1	0	0	1	0	2	0
Ontario.....	7	2	17	15	0	80	0
Quebec.....	2	25	1	5	1	47	0
New Brunswick.....	1	0	0	0	1	0	0
Nova Scotia.....	0	0	0	1	0	0	0
Foreign.....	4	0	0	20	0	6	0
Total.....	19	27	19	46	4	148	1

A charge of \$35 is made for Grade I collection, \$12 for Grade II, and \$6 for Grade III. The mineral chips, which are residues from the specimens prepared for the collections and prospectors' sets of minerals, are supplied free to prospectors. Several special collections of economic and other minerals were sent to various colleges and other institutions in Europe and the United States.

PALÆONTOLOGICAL DIVISION

E. M. Kindle, Chief of the Division, reports:

FIELD WORK

W. A. Bell was engaged in field work from June until October upon a study of the geology and mineral resources of Lake Ainslie district, Cape Breton island, with particular reference to the occurrence of petroleum. A report upon this work appears in Summary Report, 1926, part C.

F. H. McLearn spent two months in studying and mapping Mesozoic and Pleistocene deposits of the James Bay slope for the purpose of investigating the coal resources of this region. The deposits of Interglacial or peats were distinguished from the Mesozoic lignite deposits, and the latter were examined in some detail. A complete report appears in the Summary Report, 1926, part C. Fossil plants were collected from the Mesozoic series which permit of a more accurate dating of them than has been possible heretofore.

E. M. Kindle examined newly exposed parts of the Welland Canal section and the examination of certain lake marl deposits in Ottawa valley.

C. M. Sternberg collected from June 1 to September 12 in Red Deer valley, Alberta, and secured a collection of vertebrate fossils from the upper part of the Edmonton formation. These include a nearly complete skull of *Hypacrosaurus*, a disarticulated skull of *Saurotophus*, two fairly complete skeletons of *Ornithomimus*, and a complete limb of a small *Albertosaurus*; also fish, plant remains, and invertebrate fossils. A new genus and three species of fish not hitherto reported from the Edmonton beds were obtained.

OFFICE WORK

Study by Mr. Auer of the peat specimens collected by F. H. McLearn from the Pleistocene of the James Bay slope, has thrown important light on the climate of Interglacial time.

F. H. McLearn has been occupied chiefly with the preparation of maps and a report on field work of the year, and the writing of a paper on the stratigraphy of Alberta.

The office work of W. A. Bell has included: (1) preparation of summary report on the Lake Ainslie district, N.S.; (2) a report on fossil plants collected by F. H. McLearn from Missinaibi river, Ont.; (3) a report on fossil plants collected by F. A. Kerr from Stikine river, B.C.; (4) a report on fossil plants collected by G. S. Hume from the Blairmore formation, Alberta; (5) a report on fossil plants collected by F. A. Kerr from the Springhill coal-field, N.S.

Miss M. A. Fritz spent two months during the summer in the preparation, study, and arrangement of the old collections of the Survey, working chiefly on Silurian fossils.

EDUCATIONAL COLLECTIONS

High schools requesting collections of fossils have been supplied with small study collections. Collections have also been sent to one Normal school and to one college.

MUSEUM EXHIBITS

One of the new exhibits in the hall of Palæontology is a collection of fossil and recent ripple-marks. The significance of ripple-marks in interpreting the history of sedimentary rocks is illustrated by plaster-of-Paris duplicates of freshly made ripple-marks and of thread-like lines of sand left on the strand line by spent waves.

In another recently installed exhibit different types of limestone are shown and the factors concerned in their production are indicated.

Considerable progress has been made towards completing the preparation of the unique skull of *Styracosaurus*. The skeleton of a fine specimen of Pleistocene horse has been mounted, but lack of space prevents exhibition. Other material being prepared from the rock collections on hand will also have to await more space before it can be exhibited.

Accessions

Collections of fossils were received from the following field officers: H. S. Bostock, C. E. Cairnes, W. S. Dyer, C. S. Evans, A. O. Hayes, G. Hanson, W. V. Howard, G. S. Hume, F. A. Kerr, J. D. Soper, C. M. Sternberg, M. Y. Williams, and A. E. Wilson.

Gifts were received from: Mr. Benjamin L. Bowling, Mason City, Iowa; Dr. Alexander Wetmore, Assistant Secretary of the Smithsonian Institution, Washington; Brother Alphonse, Ottawa University; Hudson's Bay-Marland Oil Company; and Mr. E. M. Fyles and Mr. Hoyes Lloyd, Ottawa. A fuller account of these donations appears in the Summary Report of the National Museum.

BORINGS DIVISION

E. D. Ingall, Chief of the Division, reports:

British Columbia

In British Columbia little boring was carried on other than core drilling in testing mineral deposits. The only company reporting was the Crow's Nest Oil Company, who sent in five samples which upon examination showed practically no variation from those higher in the well.

Prairie Provinces and North West Territories

In this part of Canada the legal power to regulate boring operations for oil and gas is vested in the North West Territories and Yukon Branch of the Department of the Interior of the Federal Government, with whose officials the Borings Division works on a co-operative basis. Through their courtesy, logs and sets of samples were received from most of the important oil and gas wells. The logs received, forty-one in number, are from the following districts: Coutts-Sweetgrass, Medicine Hat, Acadian valley, Wainwright, Ribstone, Coalspur, Nanton, Turner valley, Bow river, Lesser Slave lake, Fort Vermilion, Saskatchewan, and Manitoba.

Besides these, particulars of sixteen shallow wells bored for water were received, for which thanks are due to the Soldier Settlement Board, Messrs. Duncan Bros., Redfield, Sask., the municipality of Melfort, and the Canadian Well Supply Company of Regina.

In Manitoba, borings were being put down by Mr. E. Doherty, to whom thanks are due for his continued co-operation. These wells are situated near Mafeking and give further knowledge of the lower beds of the Cretaceous section and of the underlying Palæozoic strata.

Only one sample was received from the operators of the boring near Grandview. This is unfortunate as especial interest attaches to this point, in that it is situated some distance back from the eastern outcrop of the Cretaceous, so ensuring the condition of some hundreds of feet of covering strata tending to hold in any gas or oil which may exist. With the exception of the deep water well at

Deloraine, most of the other borings in search for oil or gas in Manitoba have been put down close to the outcropping edges of the Cretaceous strata or in the Palæozoic zones farther east.

A great deal of boring for gas and oil has been done throughout the Prairie Provinces and Northwest Territories by a number of different companies, but the systematic campaign of the Imperial Oil Company and its subsidiaries has been the most prominent feature for the past few years.

This organization has shown the greatest courage and persistence, and has through the assistant chief of the geological staff, Mr. John Ness, assisted greatly in the work of the Borings Division.

Apart from records accumulated, which were made out by drillers or field geologists of the various companies, 4,093 samples of drill cuttings were received from operators during the year.

During the latter months of the year the material in the way of samples and records, covering the Prairie Provinces and Northwest Territories, was placed at the disposal of members of the geological corps of the Hudson Bay-Marland Oil Company for purposes of study preparatory to the campaign of drilling contemplated by that company. As a result of this co-operation, not only has great assistance to the company resulted, but the records of the Borings Division have been considerably enriched.

During the period July 20 to September 4, D. C. Maddox was stationed at the Calgary office of the North West Territories and Yukon Branch of the Department of the Interior to assist in the work of sample examination. The methods employed were of necessity more rapid and less detailed than those in use at the Borings Division, but were even then probably too slow for the amount of work on hand. In rapid preliminary work of this kind a very large proportion of the time taken in examination is occupied by the mechanical operations of sorting samples, opening up the sample bags, laying out the sample, and returning the sample to the container when it is examined. About 900 samples were examined in this period, over 400 of these being also bottled as type samples for the area in question.

On December 3, 1926, Mr. J. G. Spratt of the University of Manitoba reported for duty at the Calgary office of the North West Territories and Yukon Branch of the Department of the Interior, to assist the officers of that department in the work of sample examination. Mr. Spratt is a member of the Geological Survey Department, temporarily attached to the above-mentioned office, and the results of his work will form in future some part of the work done by the Borings Division.

Ontario

In eastern Canada by far the greatest activity in deep boring operations is in Ontario due to the continued exploitation of the various pools of oil and gas following on the original discovery of petroleum at Petrolia, Lambton county, in 1860, and later of the great gas-field in Welland county.

These very important discoveries led to the boring of hundreds of wells in the southern part of the peninsula of Ontario and to the location of other pools of gas or oil of varying importance. With the approaching exhaustion of the oil and gas pools, boring operations have fallen off in number.

As in the past few years, the aims of the Borings Division have been prosecuted in Ontario largely in co-operation with Col. R. B. Harkness, the Provincial Government Commissioner of natural gas. Through him have been received during the year 66 logs of borings, with an aggregate length of boring of 77,537 feet, and a total of 629 samples from various wells in the province.

In aid of the studies by Col. Harkness of the Palæozoic strata in the peninsula of Ontario, laboratory examinations by the officers of the Borings Division were made of the samples from a number of wells, which had been received in past years. Graphic and other logs were prepared and copies sent to the Commissioner for his use, as well as a map showing the location of all well records which were on file in the Division.

Quebec and the Maritime Provinces

Thanks to the courtesy of the Wallace Bell Drilling Company of Montreal, samples were received from a well put down by the firm for the Miner Rubber Company of Granby, Que.

Few deep boring operations were reported from Quebec and the Maritime Provinces, although there were doubtless the usual number of shallow wells bored for water supplies for country homes, villages, and small towns. These are undertaken by local drillers operating light portable rigs and are seldom reported to the department; they would be mostly shallow wells in the surface deposits which would give little information regarding the underlying bedrock strata.

In Prince Edward island very complete sets of samples were obtained from the two deep borings put down on Governor island, in the harbour of Charlottetown, by the H. L. Doherty Company of New York.

No. 1 well of this company was abandoned at 1,507 feet, owing to difficulties encountered in drilling. No. 2 well was, however, very successfully and speedily put down to a depth of 4,127 feet, when work was suspended.

In New Brunswick no deep borings were reported outside of the activities of the New Brunswick Gas and Oilfields, Limited, which are practically confined to the deepening of various wells.

In Nova Scotia interest in the oil and gas possibilities of the province has been revived, due to the activities of the Gulf Oil Company, the H. L. Doherty Company, and the International Petroleum Limited, whose officials have been studying the formations of the province in contemplation of a campaign of boring tests to be put down at likely places.

Some few samples of cores from a boring by the Gulf Oil Company at Mabou represent, however, all that has been received from the province, and the inauguration of any extensive boring campaign is still in the future.

Laboratory work was done on 75 cores from borings made by the Department of Railways and Canals, as test-holes, in the district of Lachine. This was in continuation of work begun in 1925.

The table given below gives particulars of samples and records received in 1925.

Province	Number of samples received	Number of wells from which samples were received	Number of records received
Maritime Provinces.....	1,082	3	3
Quebec.....	44	1	1
Ontario.....	585	4	67
Northwest Provinces.....	4,018	38	57
British Columbia.....	5	1	0
Totals.....	5,734	47	128

GEOGRAPHICAL, DRAUGHTING, AND ENGRAVING DIVISION

C.-Omer Senécal, Geographer, and A. Dickison, Chief Map Draughtsman, jointly report:

The work of the past year demonstrates the value of co-operation between departments of the Government service. By consent of the King's Printer, the Director of the Geological Survey arranged that certain maps be printed by the Assistant Director of the Geographical Section, Department of National Defence; the resultant map printing was efficiently and promptly executed. The arrangement lightened the load on commercial lithographing firms and, therefore, permitted them to engage in other types of map work urgently required. The work done by lithographing firms is under the control of the Department of Public Printing and Stationery; this work has been of a satisfactory character not only in quality, but also prompt service.

The standardizing of the various types of maps and map illustrations and their methods of preparation and reproduction has steadily simplified work; it should be noted, however, that the demands on the division have materially increased.

A large number of maps and associated illustrations were prepared for reproduction by zinc-cut process; draughting and other work necessary for the use of the geological staff were also executed.

The copper plate map-engraving section, Robert Veitch in charge, is of much value in meeting the particular requirements of the Survey.

The duties of the geographer in connexion with the Geographic Board of Canada have, as usual, been attended to.

Maps Published April 1, 1926, to March 31, 1927

Series A	Publication number	Title	Remarks
YUKON			
—	2071	Whitehorse sheet; scale, 1 inch to 4 miles.....	Geology. In memoir by W. E. Cockfield and A. H. Bell
—	2096	Galena hill, Mayo district; scale, 1 inch to 2,000 feet.	Geology. In report by C. H. Stockwell, Summary Report, part A, 1925
BRITISH COLUMBIA			
—	2097	Reconnaissance between Atlin and Telegraph Creek, Cassiar district (in two sheets); scale, 1 inch to 4 miles.....	Geology. In report by W. E. Cockfield, Summary Report, part A, 1925
✓	2098	Zymoetz River area, Coast district; scale, 1 inch to 4 miles.....	Geology. In report by G. Hanson, Summary Report, part A, 1925
✓	2099	Eutsuk Lake area, Coast district; scale, 1 inch to 4 miles.....	Geology. In report by J. R. Marshall, Summary Report, part A, 1925
✓	2103	Tatla-Bella Coola area, Coast district; scale, 1 inch to 4 miles.....	Geology. In report by V. Dolmage, Summary Report, part A, 1925
—	2104	Dease Lake area, Coast district; scale, 1 inch to 2 miles.....	Geology. In report by F. A. Kerr, Summary Report, part A, 1925

Maps Published April 1, 1926, to March 31, 1927—Continued

Series A	Publication number	Title	Remarks
MANITOBA			
✓ —	2109	Oxford and Knee Lakes area; scale, 1 inch to 2 miles.	Geology. In report by J. F. Wright, Summary Report, part B, 1925
— ✓	2110	Bigstone and Fox Rivers area (in 3 sheets); scale, 1 inch to 2 miles.....	Geology. In report by C. A. Merritt, Summary Report, part B, 1925
QUEBEC			
— ✓	2105	Parts of Duparquet and Destor townships, Abitibi county; scale, 1 inch to 1 mile.....	Geology. In report by B. S. W. Buffam, Summary Report, part C, 1925
—	2106	St. Urbain area, Charlevoix county; scale, 1 inch to 1 mile.....	Geology. In memoir by J. B. Mawdsley
188A	✓ 2111	Fournière sheet, Abitibi district; scale, 1 inch to 1 mile.....	Geology. In report by W. F. James and J. B. Mawdsley, Summary Report, part C, 1925
189A	✓ 2112	La Motte sheet, Abitibi district; scale, 1 inch to 1 mile.....	Geology. In report by W. F. James and J. B. Mawdsley, Summary Report, part C, 1925
190A	✓ 2117	Nottaway sheet; scale, 1 inch to 8 miles.....	Geology
191A	✓ 2119	Calumet island, Pontiac district; scale, 1 inch to $\frac{1}{4}$ mile.....	Geology. In report by R. W. Goranson, Summary Report, part C, 1925
NEW BRUNSWICK			
—	2094	Chipman sheet (west half), Queens and Sunbury counties; scale, 1 inch to 1 mile.....	Topography
—	✓ 2107	Chipman sheet (west half), Queens and Sunbury counties; scale, 1 inch to 1 mile.....	Geology. In memoir by W. S. Dyer
—	✓ 2108	Minto sheet (east half), Queens and Sunbury counties; scale, 1 inch to 1 mile.....	Geology. In memoir by W. S. Dyer

Maps in Hands of King's Printer, March 31, 1927

Series A	Publication number	Title	Date of requisition	Remarks
✓ 39A	1185	Nova Scotia sheet (second edition); scale, 1 inch to 8 miles.....	Nov. 6, 1926	Geology
✓ 192A	2124	Aishihik Lake area, Yukon; scale, 1 inch to 4 miles.....	Feb. 25, 1927	Geology. In report by W. E. Cockfield, Summary Report, part A, 1926

Other Map-work in Varying Stages of Progress

—	Title	Remarks
BRITISH COLUMBIA		
1	Vancouver sheet; scale, 1 inch to 8 miles.....	Geology
2	Stewart sheet (west half), Cassiar district; scale, 1 inch to 1 mile.....	Topography
3	Britannia Beach sheet (east half), New Westminster district; scale, 1 inch to 1 mile.....	Topography
4	Slocan sheet, Kootenay district; scale, 1 inch to 1 mile.....	Topography
ALBERTA		
1	Calgary sheet; scale, 1 inch to 8 miles.....	Geology
2	Cadomin sheet (west of fifth meridian); scale, 1 inch to 1 mile.....	Geology and topography
3	Mountain Park sheet (west of fifth meridian); scale, 1 inch to 1 mile.....	Topography
MANITOBA		
1	Beresford-Rice Lakes area (east of principal meridian); scale, 1 inch to 1 mile.....	Geology. For memoir by J. F. Wright
ONTARIO		
1	Fort William and Port Arthur sheet; scale, 1 inch to 1 mile..	Surface geology. For memoir by T. L. Tanton
2	Fort William and Port Arthur sheet; scale, 1 inch to 1 mile..	Bedrock geology. For memoir by T. L. Tanton
3	Wakomata (Clear) Lake area, Algoma district; scale, 1 inch to 1 mile.....	Geology. For report by R. C. Emmons, in Summary Report, part C, 1926

PHOTOGRAPHIC DIVISION

G. G. Clarke, Chief of the Division, reports that the following work was accomplished during the fiscal year:

	Inches	Inches	Number
Contact prints.....	4" by 5"	to 36 by 48	17,701
Bromide enlargements.....	4 by 5	" 40 by 72	286
Exposures developed.....	3½ by 4½	" 6½ by 8½	4,794
Dry plate negatives.....	4 by 5	" 11 by 14	381
Wet plate negatives.....	8 by 10	" 24 by 30	112
Zinc plates.....	11 by 14	" 24 by 36	26
Photostat copies.....	7 by 11	" 11 by 14	239
Lantern slides.....		3½ by 4	964
Photos and titles mounted.....			1,330
		Total.....	<u>25,833</u>

This volume of work compares favourably with the results of other years in spite of illness among members of the staff, which aggregated 133 days, and the resignation of L. Y. Clarke, process worker, whose position was vacant for 237 days during the year.

The arrangement made in 1921, whereby prints, enlargements, and other photographic copies of Geological Survey records can be obtained at cost by the public, is being used increasingly by newspapers, magazines, authors of books, universities, schools, and other persons and institutions. A tariff of charges is given in the Annual Report for 1921-22, page 19. The Geological Survey collection of negatives now exceeds 70,000 and comprises photographs taken by officers of the Geological Survey and of the National Museum in all parts of Canada over a period of fifty years. To facilitate selection from it a selected collection of prints, with titles and other data, and classified according to subject-matter, is being made for the Library as time permits. During the year extensive additions were made to this collection of prints.

GEOLOGICAL INFORMATION AND DISTRIBUTION DIVISION

Wyatt Malcolm, Chief of the Division, reports:

The work of the division consists in answering inquiries for information regarding the geology and mineral resources of Canada. This information is imparted verbally to those making application in person, and is given in the form of correspondence, memoranda, and published reports and maps. A considerable part of the technical correspondence of the Geological Survey is dealt with.

Articles were prepared during the year for publication in the *Gazette*, the British press, and the Canada Year Book. These articles dealt with such subjects as the importance of the mineral industry of Canada, the status of the industry, and the progress made. Numerous short articles were prepared for the use of the press, and were well received. In this way the readers of the newspapers and mining and scientific journals were kept informed of the nature of the publications issued from time to time by the Survey.

The publications of the Geological Survey and of the National Museum of Canada are distributed by this division. During the year 67,964 publications, exclusive of the French editions, were distributed. Of these, 22,212 were sent to addresses on the regular mailing lists, and 45,752 were distributed in compliance with written and personal requests for named publications, or requests for general or specific information.

LIBRARY

Mrs. F. E. Forsey, Librarian, reports:

Additions to the Library during the fiscal year include:

Books purchased.....	595
Volumes received as gifts or exchanges.....	754
Pamphlets.....	647
Maps.....	1,377
Periodicals subscribed for.....	191
Periodicals received as exchanges.....	392
Foreign Government documents (not otherwise counted).....	505
Canadian Government documents (not otherwise counted).....	223

Four hundred and thirty-four volumes were bound during the year, and many publications were placed in pamphlet covers. The catalogue was increased by 2,729 cards, not including those added to the map and lantern slide catalogues.

The current year shows a marked increase in the services of the Library in lending books to other institutions and obtaining inter-library loans for members of the staff: The lantern slide collection is in constant use by members of the Survey and Museum, and by loans to teachers in the city schools, and to scientific lecturers in other places.

United States topographic maps to the number of 1,164 were transferred from the Draughting Division to the Library collection, so that files of the series are now practically complete.

A revised classification for the photographic collection has been prepared by a member of the Library committee. It is hoped during the coming year that an additional assistant may be appointed who can give full time to the cataloguing and arranging of this useful collection, which has recently been augmented by the photographs belonging to the Division of Anthropology.

Among valuable gifts to the Library during the year was a selection of 33 publications of the Carnegie Institution of Washington, making almost complete our series of these publications in anthropology, biology, botany, zoology, geology, and palæontology.

BRITISH COLUMBIA OFFICE

The British Columbia office of the Geological Survey was opened in 1918, under the direction of Charles Camsell, for the purpose of making more easily available to the mining public of British Columbia and the Yukon the large amount of mining and geological information now in possession of the Geological Survey, and also to enable the Survey to keep more closely in touch with the mining industry, particularly with its geological requirements, and to assist in co-ordinating the work of the Survey with that of the Provincial Department of Mines. A reference library is maintained and a laboratory equipped for the microscopic examination of rocks and minerals.

During the year 1926-27 the office was in charge of V. Dolmage, assisted until June 1 by C. E. Cairnes and the remainder of the year by F. A. Kerr, and throughout the year by A. J. C. Nettell, as office engineer. A stenographer, Miss E. Tyacke, was employed from May until September. About 4,000 visitors registered at the offices; 528 inquiries were received and answered by mail and a much greater number by personal interview and telephone; 1,800 reports and 2,000 maps were distributed; many specimens of rocks and minerals were examined and reported on, and 23 lectures on subjects related to mining and geology were given by the staff.

NATIONAL MUSEUM OF CANADA

W. H. Collins, Acting Director

The Geological Survey was created in 1842. It was then the only scientific organization in the government service and although it was intended primarily to investigate the geology and mineral resources of Lower and Upper Canada, there soon devolved upon it a multiplicity of related functions and a field for these functions which widened vastly after the Act of Confederation in 1867. The Survey was for many years the only geographical organization in the government service engaged in actual exploration. It collected information upon climatic conditions, animal and plant life, the native peoples, navigation, water-powers, and, logically, it began a natural history museum. There is in the present mineral collection a specimen labelled 1848, which seems to be the earliest record of museum activities. In the Report of Progress for 1851, W. E. Logan, the first Director, mentions (page 54) museum work. An important expansion of museum work into the realm of biology followed the appointment of John Macoun in 1882. Active work in anthropology seems to have been initiated by a later director, G. M. Dawson, shortly before the meeting of the British Association for the Advancement of Science, held in Canada during 1897. For at least thirty years, therefore, the full complement of museum activities now being carried on by the National Museum has been in progress.

With the rapid growth of Canada it has been necessary to delegate some of the manifold original activities of the Geological Survey to new and more specialized organizations, and this adaptation to growing requirements is taking place gradually in respect to museum work. The Geological Survey still carries on all museum activities in geography, geology, mineralogy, and palæontology, an arrangement which is economical, and which provides the Museum with the services and scientific spirit of an organization of specialists unrivalled in Canada and in most other countries. The sciences of anthropology and biology are less related to Geological Survey work and two small divisions of museum specialists in these subjects have grown up, which tend to seek practical working affiliations in the Departments of Agriculture and Marine and Fisheries and in some branches of the Department of the Interior.

By such gradual and safe evolutionary processes is the museum created by the Geological Survey assuming the form and status of an independent institution. Several steps in this direction were taken during the fiscal year just ended. The most obvious of these was an Order in Council, P.C. 2165, dated January 5, 1927, whereby the museum branch of the Department of Mines is designated the National Museum of Canada.

The broader obligations connoted in this new name were recognized in a practical way, somewhat later in the year, by an arrangement with the Department of Agriculture whereby Mr. Arthur Gibson, Dominion Entomologist in that department, was made Honorary Curator of Entomology in the Museum. It is hoped that this arrangement will lead to the formation in the Museum of an exhibit of insects that will add to the completeness of the biological collections and at the same time make better known to the public one of the services that are being rendered to the country by the Department of Agriculture.

At the beginning of the year L. L. Bolton relinquished the duties of acting director, and Museum and Geological Survey are again under a common director. This combination has existed since the Survey was founded in 1842, except between 1920 and 1926, when the Museum was under separate direction,

first by the late Dr. William McInnes and afterwards by Mr. Bolton. It is one that may not continue indefinitely, for with the expansion of the Museum administrative duties are also increasing and assuming a diversity that may ultimately require the services of two directors of considerably different training and experience. Until such separation is necessary, however, the Museum can be operated for some tens of thousands of dollars less annually by the present affiliated connexion with the Geological Survey, besides profiting by its close relation with an institution that holds high rank among the scientific institutions of the world.

ANNUAL REPORT

Commencing with the year 1927 the Museum will issue in Museum Bulletin form an annual report of its activities, and as a consequence, a considerable amount of information of a scientific rather than an administrative nature which has heretofore been included in the Annual Report of the Department of Mines will be published in the Annual Report of the National Museum.

CONVENTIONS

On April 14, 1926, a conversazione for the Professional Institute of the Civil Service of Canada was held in the Museum. All branches of the Department of Mines participated in adding special exhibits to the permanent Museum displays and in arranging a program of lectures and moving pictures. The attractive decorations were provided by the Department of Public Works. Over 800 persons attended and the exhibits were kept on view during the two following days.

The forty-fourth annual meeting of the American Ornithologists' Union was held in the Museum on October 12 to 14, 1926. This was the first meeting of the society held in Canada. It was well attended from the United States and afforded an unusual opportunity for Canadian ornithologists to discuss scientific and practical problems.

MUSEUM LECTURES

The annual Museum lecture course was continued, under management of a committee composed of H. I. Smith, M. E. Wilson, and C. L. Patch. Lectures were given by officials from the Dominion Observatory, Dominion Forestry Service, Entomological Branch, Seed Branch, Fruit Commission, and Central Experimental Farm Branch of the Department of Agriculture, the National Parks Branch of the Department of the Interior, the Geological Survey, Mines Branch, and National Museum. The attendance of children at the Saturday morning lectures totalled 11,650, as compared with 12,350 last year, and the attendance of adults at the Wednesday evening lectures was 2,695 as compared with 2,303 last year.

When not required by the department the use of the lecture hall was granted free of charge for lectures, recitals, classes, plays by the Ottawa Drama League, and other meetings of an educational nature.

DONATIONS

As in former years, there were received from persons throughout Canada numerous natural history specimens which, besides enriching the Museum collections, indicate the interest that is being taken in the work of the Museum. A particularly munificent donation was made by Messrs. W. M. Southam and Sons, publishers, of Montreal, Ottawa, and other Canadian cities, who presented six fine paintings of British Columbia Indian subjects by J. Langdon Kihn, an artist living in New York, who has specialized in the portrayal of Indian life on the Pacific coast.

FIELD WORK

Investigations in geology, mineralogy, and paleontology were carried on by officers of the Geological Survey, an account of which is given in the part of this report relating to the Geological Survey. Five parties were engaged in biological work and four in anthropological work, as described in the following sections.

ANTHROPOLOGICAL DIVISION

D. Jenness, Chief of the Division, reports:

Four parties went out on field work during the summer. D. Jenness, Chief of the Division, visited Bering strait, Alaska, to excavate the ancient Eskimo ruins in that area, in order to throw light on the origin of similar ruins in Arctic Canada. C. M. Barbeau completed his studies in the social organization of the Gitksan and Tsimshian tribes of lower Skeena river, B.C. H. I. Smith continued his supervision of the work of preserving the totem-poles along the route of the Canadian National railway in Skeena River district, B.C. W. J. Wintemberg excavated an old Iroquoian village site in Simcoe county, Ontario. Only the briefest mention need be made of their work here, since fuller details will be found in the Annual Report of the National Museum.

Difficulties of transportation greatly hampered Mr. Jenness' researches in Bering Strait area, so that he was unable to visit and excavate all the places that he had intended. Nevertheless, at Wales, the nearest point of Alaska to Asia, and on Diomed islands, he dug up a number of ancient remains that throw a considerable amount of light on the early history of the Eskimos. He discovered, also, an entirely new Eskimo culture, perhaps the most ancient yet known, a culture remarkable for its wealth of ivory objects etched with beautiful scroll designs that have no parallel elsewhere in America. This discovery has awakened so great an interest in scientific circles that further investigations will probably be undertaken in the near future to elucidate the new culture in detail.

The awakening interest of the public in the unique totem-pole art of British Columbia was reflected in the activities of two members of the division, Mr. Smith and Mr. Barbeau, during the summer months. In 1925 Mr. Smith, acting under instructions from an inter-departmental committee representing the Department of Indian Affairs, the Parks Branch of the Department of the Interior, and the Department of Mines, and with the Canadian National railways, supervised the restoration of seven totem-poles at Kitwanga, in northern British Columbia. In 1926, continuing the same work, he restored nine poles in the same village. Mr. Barbeau, for his part, re-examined the totem-poles of upper Skeena river towards the end of his field season with a view to the preparation of a monograph on the subject during the winter.

W. J. Wintemberg's excavations of an old Tobacco Indian village in Simcoe county, Ontario, resulted in the recovery of an immense number of specimens, chiefly of pottery, which reveals in its main outlines the culture of the inhabitants. It would appear from his investigations that the Tobacco Indians were more closely related to an eastern group of tribes, that includes the Mohawk and Onondaga, than to the western group, of which the Neutrals were the nearest and perhaps best-known representatives.

The office duties of the staff have been unusually varied this year in that they have involved much contact with outside organizations. Mr. Jenness, by special request, attended the annual meeting of the American Anthropological Association in Philadelphia at Christmas, in order to discuss with some United States scientists the possibility of international co-operation in Arctic research.

The discussion appears to be bearing fruit in a project now on foot to send an expedition to Alaska during the summer of 1927. Mr. Barbeau, through his special knowledge of French-Canadian handicrafts, was able to render valuable assistance to the Canadian Pacific railway in the furnishing and decoration of the French-Canadian suite in the rebuilt wing of the Chateau Frontenac, Quebec. He also aided the researches of Professor Ramsay Traquair, of McGill University, into the architecture of some Quebec churches by supplying extensive notes concerning their history. Some exhibits of museum specimens outside of Ottawa are mentioned later.

Two scientific reports on shell-heap remains in Nova Scotia, one by Mr. Smith and the other by Mr. Wintenberg, were revised and handed in for publication during the winter. Four other reports are in preparation: one, by Mr. Smith, on the *Materia Medica* of some British Columbia tribes; a second, by Mr. Wintenberg, on the archæology of the Roebuck village site in southwestern Ontario excavated by him in 1912 and 1915; a third, by Mr. Barbeau, on the totem-poles of Skeena River region; and a comparative vocabulary of the western Eskimo dialects, by Mr. Jenness. Two voluminous reports by former field workers are gradually coming in and being edited by Mr. Jenness. One is by Prof. Leonard Bloomfield, of Ohio University, on the Cree Language and Folklore, the other by Prof. T. F. McIlwraith, of the University of Toronto, on the Bella Coola Indians of British Columbia.

The ethnological and archæological collections of the Museum were augmented by about 4,000 specimens since April 1, 1926, exclusive of forty-nine cases of archæological specimens brought in by Mr. Wintenberg that are still unpacked because adequate storage cabinets are not yet available. The majority of these 4,000 specimens were obtained by members of the staff in the course of their field work; but an appreciable number were donated by members of the Royal Canadian Mounted Police and of the North West Territories Branch of the Department of the Interior. It is a pleasure to acknowledge the continued support of these two branches of the government service which have contributed so materially to the Museum's collections from the Arctic.

Several donations have been received from private individuals. The most noteworthy was the presentation to the Museum by the Messrs. Southam, publishers, of six magnificent paintings of British Columbia Indian subjects, the work of the noted painter, J. Langdon Kihn. Five of the paintings are now on display in the east exhibition hall of the division, where they have attracted much attention.

The old storage rooms on Wellington street were abandoned during the year in favour of new quarters on Frank street. The Frank Street storage rooms are commodious and virtually fire-proof, but they are inconveniently located away from the Museum and are not heated during the winter. They can be used, therefore, only for the less perishable specimens that are not immediately required for purposes of study or exhibition.

Cordial relations were established during the year with the Royal Ontario Museum of Archæology, Toronto, to which the National Museum is presenting a selection of the Eskimo specimens gathered on the Canadian Arctic Expedition of 1913 to 1918. As the ethnological collections expand, it is hoped to assist other museums throughout Canada in the same way, and to secure their support in building up a truly national collection at Ottawa. Arrangements are also being made with the National Museum of Copenhagen, Denmark, to exchange some British Columbia specimens for Greenland material, to round off the Eskimo collections.

Normal school students and others have continued to borrow specimens for teaching purposes, and small collections are set aside for this purpose. The preparator, Mr. Leechman, gives adequate instruction to all applicants. A few lantern slides have also been borrowed for local lectures.

The Coast Salish and Bella Coola cases in the west exhibition hall were entirely revised during the year by Mr. Leechman, who also arranged a temporary exhibit of French-Canadian homespuns. A few specimens of West Coast carving were lent to the National Art Gallery for exhibition at Paris with the Wembley collection of Canadian paintings. The Canadian Handicrafts Guild of Montreal exhibited a collection of French-Canadian hand-made pottery, and the Toronto Art Gallery, a collection of French-Canadian wood-carving and other crafts, specimens being borrowed in both cases from the National Museum. A large selection of ethnological specimens representative of all parts of Canada is being prepared for the festival of the Oblate Order at Joliette, Que., during the coming summer.

All these activities indicate that the public is awakening to the value of the Museum's anthropological collections and endeavouring to use them more extensively.

These collections have more than doubled during the last few years; the catalogues list over 50,000 entries, and the number of actual specimens is considerably greater. The cataloguing, repairing, storing, and regular inspection of these specimens have devolved hitherto entirely upon one man, who, in addition, performs many duties of a strictly technical nature. It is manifest that further assistance will be necessary to enable the division to care for and display to the best advantage these unique and valuable collections.

BIOLOGICAL DIVISION

R. M. Anderson, Chief of the Division, reports:

Progress has been made in installing biological exhibits in the Museum halls. Six additional unit-sized cases of mahogany and plate-glass construction have been set up during the year. A number of small bird groups have been prepared, and a number of small mammals mounted singly. Exhibition of large specimens cannot be made on an extended scale in the space at our disposal.

As a result of field work by members of the staff, considerable additions have been made to the reserve study collections and to a number of specimens suitable for mounting in the future. A few specimens have been purchased and some valuable specimens have been obtained by gift or transfer from other departments, notably from the Canadian National Parks Branch, Department of the Interior; North West Territories and Yukon Branch, Department of the Interior; and the Royal Canadian Mounted Police.

Some progress has been made in identifying and arranging the systematic collections, particularly in mammalogy, ornithology, and herpetology, and considerable data have been assembled along these lines, all of which will be valuable in future publications.

Field work was carried on by various members of the Museum staff as follows:

R. M. Anderson, zoologist (Mammalia), Chief of the Division of Biology, in Gatineau district, Que., north of Ottawa, from October 25 to November 14, 1926.

P. A. Taverner, ornithologist, left Ottawa May 15, 1926, and worked near Lac-la-Nonne, near Belvedere, Alberta, about 60 miles northwest of Edmonton, returning to Ottawa, July 26. H. M. Laing and C. G. Harrold, junior zoologists (temporary), began work on May 24 as assistants to Mr. Taverner and continued work there until September 30.

M. O. Malte, chief botanist, National Herbarium, did local field work on the flora of Ottawa district until the middle of June. On June 16 he left for field work in New Brunswick and Prince Edward island. He returned to

Ottawa in time to attend the International Congress of Plant Sciences at Ithaca, N.Y., August 15 to 24, and was engaged for the rest of the season in local work in the vicinity of Ottawa.

C. H. Young, collector-preparator specialist, left Ottawa May 10 and collected in Cypress hills, Sask., south of Maple creek, until July 13. He then moved to the edge of the foothills west of Olds, Alberta, returning to Ottawa on September 20.

C. L. Patch, chief taxidermist and herpetologist, D. Blakely, taxidermist, and C. E. Johnson, did some field work in Ottawa district, principally collecting accessories for habitat group work.

Jos. Rochon, osteological preparator, accompanied R. M. Anderson in Gatineau district from October 25 to November 14. Otherwise he was employed in laboratory work.

J. D. Soper, junior zoologist (temporary), continued his work in Baffin island, where he had been engaged continuously since the summer of 1924. In January and February, 1926, he made a traverse by sledge from Cumberland sound to Fox channel, returning along the north side of Nettilling lake, and completing the survey which he began the preceding year. He brought the collections of 1925 to the coast by sledge and boxed them for shipment to Ottawa. In April, 1926, he made a sledge trip from Pangnirtung to Amadjuak bay on Hudson strait, and spent the early part of the summer in biological collecting at cape Dorset, at the southwestern corner of Baffin island, returning later to Amadjuak. He returned to Ottawa on October 7.

Accessions to the biological collections were as follows:

Birds received and catalogued.....	1,605
Mammals received and catalogued.....	781
Reptiles and amphibians received and catalogued.....	259
Birds' eggs in sets, and nests.....	121
Birds' stomachs (in formalin), for investigation of contents, received and catalogued.....	1,336

The only important publication by the museum staff during the year along biological lines was "Birds of Western Canada," by P. A. Taverner, Museum Bulletin No. 41, Biological Series No. 10, which has been in preparation for several years. Other members of the staff have contributed brief notes and reviews to periodicals, but no formal articles have been listed.

MINES BRANCH

John McLeish, Director

The organization of the branch is being expanded as rapidly as controlling conditions will permit, but not, perhaps, at a pace that satisfies public demand for investigations that will contribute more directly to the expansion of a rapidly growing mining industry.

Changes in staff during the year included twelve appointments to permanent positions; one resignation from a permanent position; thirteen temporary appointments; and seventeen resignations or separations from temporary work.

The Mines Branch has continued to co-operate to the fullest extent with Provincial and other Government departments, and with scientific organizations engaged in similar lines of investigations; and to render service to those Government departments desiring assistance and advice of the character which the branch is able to give.

An outstanding example of this policy of co-operation is shown in a conference which took place in Ottawa on March 1, 1927, between representatives of the United States Bureau of Mines, the Mines Branch of the Department of Mines, and the Research Council of Canada, on the subject of the beneficiation of iron ores. The chief purpose of this meeting was to come to a common understanding of the problems affecting the mineral industry in both countries, and to discuss ways and means by which information could be compiled, and present and future investigations co-ordinated to the advantage of the industry of both countries. The meeting was held under the authority of the Minister of Mines.

A scheme for co-operation between the two countries is being developed similar to that now existing between the United States Bureau of Mines and the British Fuel Research Board on fuel research.

The activities of the several divisions of the Mines Branch organization during the year are briefly reviewed in the following pages, wherein are shown the variety and extent of the work accomplished and under way.

MINERAL RESOURCES DIVISION

The Chief of the Mineral Resources Division, A. W. G. Wilson, spent about three months on field service during the season of 1926. Early in the season his services were requisitioned by the Advisory Board on Tariff and Taxation in connexion with the hearings on magnesium sulphate and on the iron and steel industries; later Mr. Wilson accompanied members of the Tariff Board on an inspection trip, visiting the iron furnaces and the principal steel plants in Ontario, Quebec, and the Maritime Provinces. One short trip was made in July to a locality in Ontario where a deposit of beryl was being prospected by trenching. About two months were devoted to an inspection trip to western Canada. In Alberta a short time was spent at Edmonton, where the Mines Branch, in co-operation with the Parks Branch of the Department of the Interior, was constructing a new type of internally heated mixer for preparing asphalt paving mixes; later, two visits were paid to Jasper park where experimental road surfacing with asphaltic material brought from McMurray area was in progress. On the return trip visits were made to Turner Valley oil-field and also to the new Ribstone field between Chauvin and Lloydminster,

the latter being visited early in October. In British Columbia inquiries with respect to the present status of the iron and steel industry were made at Vancouver, Victoria, and Fernie; a short trip was also made along the line of the Pacific Great Eastern railway, several days being spent in the vicinity of Quesnel in company with Mr. V. L. Eardley-Wilmot, who was examining large deposits of diatomite in that district. In February some studies in the marketing of minerals were made at United States points.

H. S. Spence spent about six weeks in the field. He examined deposits of lithium-bearing minerals in Pointe du Bois district, Manitoba; anthraxolite and feldspar mines near Sudbury, Ont., the asbestos workings near Timmins, Ont., and graphite mines in Ontario and Quebec. In addition, Mr. Spence made an investigation of the soapstone industry, visiting the deposits that have been developed in Lake of the Woods region, western Ontario, and in the Eastern Townships, Que. A survey of the principal Canadian sulphate pulp-mills was also made, in order to gather data relating to the requirements of this industry with respect to soapstone. The information gathered on the subject of soapstone is to be published in the form of a separate Memorandum Series report. Owing to an injury suffered while engaged on field duties, Mr. Spence was prevented from carrying out his full program of field work, which included surveys of the feldspar and mica industries. It is planned to conduct these latter investigations in 1927, and to make them the subject of special reports.

L. H. Cole spent the months of July, August, and September completing the investigation of the silica deposits of western Canada. The first month was spent on a detailed examination of the sandstone deposits at Black island. While in that vicinity three days were spent on Deer island examining the reported deposit of kaolin. The remainder of the season was spent in British Columbia visiting numerous silica localities, and the gypsum deposits in Cranbrook district and at Falkland, B.C. One day was spent at Soap lake, a sodium carbonate lake 7 miles south of Spences Bridge. Several days in the autumn were spent in Montreal and Toronto investigating the progress made in the gypsum industries in these two centres.

S. C. Ells spent seven months on field work this season in connexion with his work on the bituminous sand of McMurray area. Leaving Ottawa on May 14 he proceeded to McMurray, where arrangements were made for the opening of a quarry in a bed of bituminous sand on the north bank of Clearwater river, a mile below the present end of steel at Waterways. Subsequently thirteen carloads of bituminous sand, about 375 tons in all, were excavated and shipped to Jasper park, Alberta, for use in road surfacing. When satisfactory progress had been made in developing the quarry, Mr. Ells returned to Edmonton to design and supervise the construction of an internally heated mixing plant. Through the courtesy of the Mayor and City Engineer of Edmonton, machine shop facilities at the municipal paving plant were placed at the disposal of this department and a two-drum mixer was constructed. This machine, when completed, was shipped to Jasper park and was installed on a siding of the Canadian National railway. The first shipment of bituminous sand from Waterways was received near the end of September. The work of surfacing the main driveway of the park commenced early in October. Unseasonable weather interrupted the work at times, but 2,700 lineal feet of surfacing 15 feet in width (wider on curves) were laid in sixteen and a half working days. During the laying of the pavement Mr. Ells was aided by Mr. G. P. Connell, chemist from the Fuel Testing Division, who took samples, made running analyses of the mixes, and assisted in other ways as required. All the work of excavating and paving was done in co-operation with the engineers of the Parks Branch, which branch also furnished both the labour and road-building equipment. In addition to the above work, Mr.

Ells was able to devote a little time to the study of methods best adapted to sampling the deposits of bituminous sand by core drilling. This work could not be completed, owing to the pressure of other duties, but it is hoped to finish it next season. Returning to Ottawa about the middle of November, Mr. Ells afterwards spent three weeks in Texas investigating paving practice and internally heated equipment as applied to the surfacing of roads with natural rock asphalt. A report reviewing the results of the past season's work is now in press.

M. F. Goudge continued the systematic survey of the limestone and dolomite resources of Canada, commenced the previous year. The field season was devoted to a study of limestone occurrences and the condition of the lime quarrying industry in eastern Quebec, including Gaspé and the Maritime Provinces.

A. H. A. Robinson spent six weeks on field work in preparation for a monograph on the lode mining of gold ores. Current mining activities in northwestern Ontario and in Manitoba were investigated, and visits were made to Toronto and Winnipeg to interview provincial authorities. Opportunity was also taken to visit several lead-zinc properties in eastern Ontario that were idle in 1925, but were reported to have reopened in 1926.

V. L. Eardley-Wilmot completed the field work for his monograph on "Diatomite and Its Uses." Most of the season was devoted to a study of deposits of this material on the Pacific coast, visits being made to the principal localities in California, Nevada, Oregon, and Washington, where commercial operations are in progress. A number of deposits in British Columbia were examined, on Vancouver island and in the vicinity of Quesnel and Kamloops. The metal quicksilver has been attracting attention on account of a favourable market price; Mr. Wilmot was, therefore, instructed to visit the principal operating deposits in California to observe recent developments in methods of mining and in the metallurgy of the ores. He afterwards inspected the deposit at Kamloops lake, B.C., where prospecting was in progress. Numerous samples were secured and shipped to the laboratories at Ottawa. Subsequent work in the testing laboratories indicated that the ores sampled were of too low a grade to be operated commercially. During the season short trips were made to a locality in Ontario where beryl was being sought, and to the Black Donald graphite mine; in British Columbia localities in which manganese and molybdenite occur were visited.

Arthur Buisson, mineral technologist in charge of the records section, spent five weeks in visiting the principal mining camps in northern Ontario and western Quebec, including Sudbury, Cobalt, Kirkland Lake, Porcupine, and Rouyn areas.

E. H. Wait, of the Records section of this division, spent six weeks on field work in the Maritime Provinces, visiting all the principal localities where active mining operations were in progress, for the purpose of studying current operations.

C. H. Freeman, of the Records section of this division, spent three months on field duty at various points in the Eastern Townships of Quebec and in old Ontario. His principal duty was to visit localities where active mining operations were in progress, to study current conditions in the industry. Special attention was paid to the asbestos industry in Quebec and to the salt and gypsum industries in Ontario.

Miss D. M. Stewart, while on a trip to the lower gulf of the St. Lawrence, was instructed to visit points on the island of Newfoundland to obtain information with respect to occurrences of diatomite. Samples of native diatomite procured by her were transferred to Mr. V. L. Eardley-Wilmot for examination and for comparison with material collected by him in the Maritime Provinces.

Much time was spent by the chief of the division and by other members of the staff in the preparation of news letters on mineral resources and the mining industries, for distribution in Great Britain, and in the preparation of special articles for publication in the technical and Canadian press. Mr. A. H. A. Robinson collaborated with Mr. Wyatt Malcolm of the Geological Survey in the compilation of a handbook of over 200 pages, published exclusively for distribution to the attending members of the Second (Triennial) Empire Mining and Metallurgical Congress meeting, in Montreal, August 22-23, 1927, and touring Canada during the following month.

John Casey, in charge of statistical records and of the compilation of special statistical data, was assigned in January, 1927, the additional duties of making the annual survey of consumption of fuel for domestic purposes in the provinces of Ontario and Quebec, the acute fuel area, which had been initiated and carried out during the previous three years by the Dominion Fuel Board.

ORE DRESSING AND METALLURGICAL DIVISION

W. B. Timm, Chief of the Division, reports:

The increased activity in the mining and metallurgical industry, with the opening up of new fields, the erection of milling and concentration plants, and the advance in metallurgical practice, have resulted in a greater demand for experimental work. The technical officers have been busily engaged in investigatory work, both in the field and in the various laboratories of the division.

The following field investigations were undertaken by officers of the division in order to keep in touch with new developments in ore dressing and metallurgy that give promise of being applicable to the treatment of Canadian ores:

The Thornhill-Anderson process for direct reduction of iron ores.

The experimental work in progress at the Minnesota School of Mines on the direct reduction of iron ores.

The Grenoble process for the production of electrolytic iron, at Niagara Falls, N.Y.

The Western Electric Company's process for the production of electrolytic iron, at Hawthorne, Ill.

Brine leaching and the Tainton process for lead-zinc-silver ores, at Kellogg, Idaho.

The Gordon-Keith process for lead-zinc-copper ores, at Salida, Colo.

The ammonia leaching process for copper ores at Lake Linden, Mich.

The process to be applied to the Flin Flon ores of northwestern Manitoba—the experimental work at Denver, Colo.

Developments in selective flotation of complex sulphide ores in the western and mid-western United States.

W. B. Timm spent between three and four months in the field visiting milling and concentrating plants, and metallurgical works, securing information on the progress made in ore dressing and metallurgical practice. He spent some time in British Columbia, in northern Ontario, and western Quebec. With R. J. Traill, he investigated certain processes for the production of electrolytic iron and the direct reduction of iron ores, as listed above.

LABORATORY INVESTIGATIONS IN ORE DRESSING AND METALLURGY

C. S. Parsons, assisted by J. S. Godard, conducted investigations on metallic ores. Mr. Parsons spent two months in the field visiting a number of milling and concentrating plants and metallurgical works in southern British Columbia, and the western and mid-western United States, investigating certain of the processes listed above. Distinct progress is being made in the application of selective flotation and Mr. Parsons prepared for publication a review, bringing the information up to date, on: "Selective Flotation as Applied to Canadian Ores."

J. S. Godard spent a month in the field in northern Ontario and western Quebec in connexion with the laboratory investigations. The laboratory investigations conducted by Messrs. Parsons and Godard were as follows:

- The concentration of the lead-zinc ore from the Dunwell mines, Bear river, Stewart district, B.C.
- The concentration of the gold-copper-pyrrhotite "F" ore-body of the Horne mine, Rouyn, Que.
- The treatment of a complex ore containing values in gold, silver, lead, zinc, copper, and arsenic, from the J. and L. mine, Revelstoke, B.C.
- The treatment of an arsenical-gold ore from the Mount Evelyn mines, Hudson Bay mountain, B.C.
- The concentration of lead-zinc tailings of the Tetreault mine, Notre-Dame-des-Anges, Que.
- The concentration of a complex ore containing values in gold, silver, copper, lead, and zinc, from Alberni, B.C.
- The concentration of the zinc and copper-zinc ores from the Alderson-MacKay mine, Rouyn, Que.
- Experimental tests on the gold ore from the Gold Hill mines, Boston Creek, Ont.
- The concentration of the zinc ore from the John Bull and Florence claims (Malaspina mine), Powell river, B.C.
- Experimental tests on the recovery of gold and arsenic values in the Long Lake mine tailings, Naughton, Ont.
- The concentration of the silver-lead ore of the LaRose mine, Alice Arm, B.C.
- The concentration of the lead ore of the Frontenac mine, Perth road, Ont.
- Experimental tests on the gold-copper ore of the Argonaut mine, Argonaut, Ont.
- Experimental tests on the gold-copper ore of the Central Manitoba mines.
- The concentration of the complex ore containing lead, zinc, gold, and silver values, of the Bunker Hill mine, Alice Arm, B.C.
- Concentration of the lead-barite ore of the Giant mine, Spillamacheen, B.C.
- Experimental tests on a copper-gold ore from east-central Manitoba.
- The concentration of the lead-zinc tailings of the Whitewater mine, Retallack, B.C.
- The concentration of the values in the Dome mine tailings, South Porcupine, Ont.

R. K. Carnochan conducted investigations on non-metallic minerals. He spent three weeks in the field visiting industrial plants in the eastern United States. The equipment of the non-metallic laboratory was completed during the year, and the following investigations undertaken:

- The fine grinding, with the elimination of graphite impurities, of calcite from a deposit near Perth, Ont.
- The concentration of low-grade, fine graphite flake, from Buckingham; Que.
- The preparation of bentonite to meet market requirements.

H. C. Mabee, in charge of the chemical laboratories, reports that over 4,000 determinations were made on 1,243 samples of ores and products from test operations.

Assisted by A. E. Smaill, he continued the work and reports progress on: "An Investigation of Heavy Sulphide Ores for the Recovery of the Iron and Sulphur Content in Addition to the Base and Precious Metals."

R. J. Traill supervised the work of the electro-chemical laboratory. The following investigation was completed:

The treatment of ilmenite ores for the production of electrolytic iron and titanium oxide concentrate.

An investigation was started and is in progress on:

The treatment of high iron copper concentrates for the recovery of the iron as electrolytic iron, of the sulphur as elemental sulphur, of the copper as cement copper, and of the precious metal values in the leached residues.

Laboratory accommodation was provided for certain members of the technical staff of the National Research Council for the continuation of their investigation on the beneficiation of the Grenville magnesites of Quebec.

FUELS AND FUEL TESTING DIVISION

B. F. Haanel, Chief of the Division, reports increased activity in investigational and routine work. The chemical staff was increased by the appointment of A. F. Gill, in connexion with oil analyses. J. D. Johnston was transferred to the Division of Ore Dressing and Metallurgy and J. L. Bowlby hitherto temporarily employed appointed to the permanent position.

INVESTIGATIONS AND EXAMINATIONS MADE BY THE CHIEF OF THE DIVISION AND TECHNICAL ENGINEERS

In addition to directing and planning the work of the division, Mr. Haanel attended the regular meetings of the Dominion Fuel Board, and devoted a large part of his time to conferences in connexion with the operations which will be conducted at Alfred, Ont., for the manufacture of peat fuel. This work will be carried on under the auspices of the Mines Branch. He investigated, in the course of the year, processes for manufacturing colloidal fuels; domestic fuels by carbonizing bituminous and other coals at low temperature; peat fuel according to the Danish Hydro-Peat process; and processes for the recovery of oil from oil-shales. These investigations involved trips from Ottawa to Montreal, Toronto, Buffalo, New York, and elsewhere. He also prepared memoranda in connexion with various processes for treating fuels. He attended the International Conference on Bituminous Coals held in Pittsburgh, November, 1926, and the Power Exhibition held in New York in December of that year.

E. S. Malloch and C. E. Baltzer devoted the major part of their time to the completion of the work in connexion with the testing of fuels in domestic hot-water heaters, and in the preparation of the preliminary and final report. They also spent a considerable amount of time on the preliminary work in connexion with the proposed Fuel Power Survey. Mr. Malloch attended the Power Exhibition held in New York in December.

FUEL TESTING LABORATORY WORK

R. E. Gilmore, superintendent, reports increased activity in respect to work of an investigational nature, accompanied by an increase in the amount of analytical work requisitioned from outside the division. He attended the International Conference on Bituminous Coals held in Pittsburgh November 15 to

18. He reports that important results were obtained in connexion with the amenability of crude shale oil (from oil-shales of the Maritime Provinces) and of bitumen (from the bituminous sands of Alberta) to pressure cracking refining methods for the production of motor gasoline and light fuel oil. Special standard samples of dehydrated topped bitumen and crude shale oil were first prepared in the laboratories at Ottawa. The tar sand bitumen was sent to the Kansas City Testing Laboratory, where it was cracked according to the Cross process, and the shale oil to the Laboratories of the Universal Oil Products Company of Chicago, where it was treated according to the Dubbs process. The results of the pressure cracking tests will be reported in "Investigations of Fuels and Fuel Testing", along with the other investigations conducted during 1926. The work of the laboratories was conducted under four sections, viz.:

- (1) Solid fuel analyses and related investigations.
- (2) Carbonization of coals and other solid fuels.
- (3) Liquid fuel analyses and investigations of petroleum products.
- (4) Oil-shale and bituminous sands laboratory investigations.

Investigations

The investigational work of the laboratories had the constant attention of Mr. Gilmore, which work may be summarized under the names of the technical officers taking charge of each of the four sections just mentioned.

J. H. H. Nicolls supervised the solid fuel analytical work on samples originating within the division and those sent in from outside. In addition, Mr. Nicolls continued his investigation on the laboratory air drying of lignites and other high moisture fuels and kept up to date his study of classification schemes as applied to Canadian coals. He also continued investigating the forms of sulphur in Canadian coals and coke, in which work he was assisted part time by Messrs. Johnston and Bowlby.

R. A. Strong was placed in charge of the carbonization section of the laboratories. He conducted further low temperature carbonization runs on ten representative Canadian bituminous coals, two from the Maritime Provinces, four from Alberta, four from British Columbia. In connexion with this work he made a trip to western Canada for the purpose of getting first-hand information on carbonization and general fuel problems of that part of the country. During the year he co-operated with Mr. G. A. Brown of the Department of Soldiers' Civil Re-establishment in revising the specifications for the purchase of coal for that department.

P. V. Rosewarne supervised the work of the oil laboratory and related investigations. With the assistance of A. F. Gill, he conducted the annual (1926) gasoline analysis survey and continued his investigation of the utilization of waste crank case lubricating oil. He also developed special laboratory methods for dehydrating wet tar sand bitumen and other oil-water emulsions, in which work he was assisted by G. P. Connell. Another duty assigned to Mr. Rosewarne was a study of oil distillation and pressure cracking apparatus suitable for installing in the proposed new technical scale laboratories.

A. A. Swinnerton, as in previous years, was assigned work in connexion with oil-shale and related subjects. His duties during the year included also the conducting of special laboratory investigations on bituminous sands. The program outlined for the conducting of investigations in connexion with the recovery of oil from oil-shales could not be carried out entirely, owing to the lack of space and equipment for conducting retorting experiments on a sufficiently large scale to provide data that would be of practical value in connexion with attempts to develop the oil-shale resources of the Maritime Provinces. Mr. Swinnerton conducted an investigation of laboratory methods for the examination of bituminous sand samples. In this work he was assisted by G. P. Connell.

Chemical Laboratory Work

During the year a total of 775 samples of solid, liquid, and gaseous fuels were examined. Three hundred and thirty-eight of these, nearly 44 per cent of the total, were sent in from other divisions of the Mines Branch, from the Geological Survey, from other Government departments, and from public institutions, commercial firms, and individuals. The remaining 56 per cent pertained to investigations conducted by the technical staff of the laboratories.

Of the total samples sent in from outside the division, 52 were from other divisions of the Mines Branch, 98 from the Geological Survey, 84 from the Department of Soldiers' Civil Re-establishment, 49 from the Departments of Interior, National Defence, Marine and Fisheries, Customs, Public Works, etc., and 55 from the Ontario Government, public institutions, commercial firms, and individuals.

The following is a classification of the samples analysed:

Solid fuels: total samples examined.....	489
Coals (various kinds).....	362
Cokes and chars.....	17
Peat and brown coals.....	81
Briquettes and miscellaneous.....	29
Liquid fuels: total samples examined.....	286
Gasoline.....	118
Lubricating oils.....	39
Coal tar oils and liquor.....	30
Other petroleum oils and miscellaneous.....	28
Oil-shales and bituminous sand products.....	52
Gases from coal, oil-shale, etc.....	19

Work Performed by the Mechanical Staff

Mr. A. W. Mantle, mechanical superintendent, reports increased work in connexion with the designing and construction of machinery, apparatus, and repairs to existing machines for all divisions of the Mines Branch and for the Geological Survey. Work was performed for the entire department, involving labour costs of approximately \$8,000, and costs of material amounting to approximately \$4,400.

CERAMICS AND ROAD MATERIALS DIVISION

Howells Fréchette, Chief of the Division, reports much work in progress. This work, in some ways, was seriously hampered through the illness of Mr. Collin, who was on sick leave from September 13 to March 30, and Mr. Fréchette, who was on sick leave from October 18 to January 2.

J. F. McMahan, ceramic engineer, was retained on the temporary list throughout the year.

During the year a considerable amount of time was devoted to the draughting and revision of standard specifications for broken stone roads, by Mr. Fréchette, Chairman of the Broken Stone Roads Committee of the Canadian Engineering Standards Association.

Very full data as to the various sizes of brick manufactured in Canada have been collected by Mr. Fréchette. The large number of sizes of building brick found to be on the market made it evident that the adoption of a definite standard size was very desirable and, through his instrumentality, the Engineering Standards Association constituted a committee to deal with it, with Mr. Fréchette as chairman. A tentative standard was adopted, and the principal brick manufacturers of the country have agreed to conform to it. It is expected that most of the others will also do so.

CERAMICS

About three months were spent by Mr. L. P. Collin in the field, in connexion with an investigation on scumming and efflorescence of brick. Work was done at thirteen plants in Ontario and Quebec where scumming troubles were being experienced. At these plants the cause of the scumming was studied, and samples of raw materials secured, where subsequent laboratory work was necessary, with a view to suggesting means to overcome the trouble. A number of brick plants in Ohio and Pennsylvania were visited in order to obtain the latest information regarding the corrective methods used for overcoming scumming.

Laboratory Work

Owing to the illness of Mr. Collin, only a small amount of work was done on his research on the compounding of porcelain bodies for electrical heating devices.

Mr. McMahon spent the greater part of the year on a research on the refractoriness of moulding sands, a research which is being conducted in parallel with the United States Bureau of Standards and Cornell University.

Seventy-one samples of clays and shales were tested. Tests were also made on five samples of mineral pigments, three samples of limestone, three samples of feldspar, one sample of magnesite, and five samples of moulding sands.

An extended test was made on a series of shales for a firm that is about to manufacture face-brick.

The transverse strength of one sample of brick was determined.

Several samples of fire-brick were tested and reported on for Government departments.

During the year numerous refractory shapes were made for use in the ceramic laboratory and for other laboratories of the department.

The facilities of the laboratories, and the assistance of the staff were on several occasions placed at the disposal of the Air Board and the Department of Marine and Fisheries for special tests.

In co-operation with the Research Council of Canada, an exhaustive laboratory investigation of the suitability of the magnesite from Grenville township, Que., for the manufacture of high-grade refractory brick, has been under way during the entire year. This work is being done by R. T. Watkins, ceramic engineer, and although much remains to be done, the results so far obtained show good progress and prospects of success.

During the year the facilities of the laboratory were placed also at the disposal of the Department of Colonization and Development of the Canadian Pacific Railway Company, for the testing of samples of clay from southern Saskatchewan. This division now has on file the complete report of Mr. G. M. Hutt, of the Canadian Pacific railway, who collected the samples in the field and performed the laboratory tests, and much has thus been added to the available information as to the clay resources of that section of the country.

ROAD MATERIALS

During the field season R. H. Picher, road materials engineer, visited fifty-one active commercial crushed stone quarries in Ontario and Quebec and collected samples of rock for the purpose of determining the quality for road building purposes. Six commercial gravel pits were visited for the same purpose.

While on the above investigation Mr. Picher consulted with county road officials as to the source of supply, and behaviour in service, of the various materials used on country roads. Thirteen county highway quarries and five

county gravel pits were sampled and observations were made of the wearing quality of the materials by an inspection of the roads served by them.

Twenty quarries and seven gravel pits, privately owned, which are operated intermittently, were examined and, in some cases, sampled.

Laboratory Work

The work on the road materials laboratory was confined to the testing of the samples of rock and gravel collected by Mr. Picher in the course of his field work, to determine their suitability for road construction and maintenance.

CHEMISTRY DIVISION

F. G. Wait, Chief of Division, reports:

From April 1, 1926, to March 31, 1927, twelve hundred specimens have been reported on.

The work of the different members of the chemical staff has been as follows:

H. A. Leverin concluded his investigation on titanium pigment and submitted a final report thereon. In addition, he examined mineral specimens and made a number of analyses of alloys, abrasives, limestones, etc.

R. T. Elworthy completed his report on helium and natural gas. He investigated the actions of acids on bituminous sands and the preparation of pure methane from natural gas, also the oxidation of natural gas. From September he was on special leave.

E. A. Thompson has made complete analyses of three specimens of grey-wacke and one other rock for the officers of the Geological Survey, also a sample of gypsum.

Three samples of saline water were analysed and the determination of lithium and fluorine in a specimen of lepidolite, also a complete analysis of two samples of Allenby mine tailings and concentrates.

Microscopic examinations were made of Allenby mine ore and tailings; Gold Hill ore from Boston Creek; Ivory ilmenite ore, also sponge and residue after treatment of the ilmenite ore for the making of electrolytic iron; titanium paint pigment and accessory materials; also stream line wire, for Royal Air Board. Microphotographs were made in each case.

Metallographic examination of twenty specimens of electrolytic iron was made, also microphotographs.

James Moran was engaged chiefly in the work of mine air analyses. Two hundred and seventy-two samples were analysed during the year, a number of them calling for special work in determining the nature of the air following blasting operations, mine fires, and feeder gas, etc.

Included in this work, also, were the preparation of memoranda for the guidance of mine operators and inspectors, and special reports covering mines where fatal accidents occurred.

A. Sadler made a large number of furnace assays and analyses, complete and partial, of ores and minerals.

He has also examined several earths and clays as to their suitability as decolourising agents for oils and fats. The object in view was to find a Canadian substitute for imported fuller's earth and other like media.

Considerable tests were run on bentonite, but these in their natural state were found to be comparatively poor decolourizers of oils; nevertheless it was discovered that in the presence of other reagents very satisfactory results were obtained.

G. P. Connell was loaned to the Fuel Testing Division where he has been employed for the year.

DOMINION OF CANADA ASSAY OFFICE, VANCOUVER, B.C.

The report of the Assay Office for the calendar year ending December 31, 1926, shows an increase of business over that of the previous year. The value of the gold bullion deposited during the year amounted to \$2,524,337.36, an increase of \$459,120.42 over that of the year 1925. The number of deposits during 1926 also showed an increase, there being 1,752, as compared with 1,679 of the previous year.

In addition to the work connected with the purchase of gold bullion, the office acted as agent for the Department of Finance in connexion with the work of the redemption or taking out of circulation of foreign coin, received from the chartered banks of Vancouver and vicinity. This additional work was undertaken in July, but as only a small section of the staff was available for receiving, checking, and shipping the coin, the services of a member of the Vancouver post office staff were obtained to assist in this connexion. This work was carried on until late in November, when the Department of Finance made other arrangements.

The following table shows the number and value of gold bullion deposits at this office for the past five years:

Calendar year	Number of deposits	Net value	
		\$	cts.
1922.....	1,646	2,105,989	64
1923.....	1,639	2,051,369	65
1924.....	1,618	1,850,373	74
1925.....	1,679	2,065,217	16
1926.....	1,752	2,524,337	58

The purchase and disposal of the gold bullion deposited during the year just ended required a total of 1,853 meltings and 1,853 assays, quadruplicate assays being made in each instance, including the melting into large bars of the smaller deposits after purchase, and the assaying of same before shipment.

The aggregate weight of all deposits before melting was 162,606.56 troy ounces and after melting 145,309.73 troy ounces, included in which were 106 deposits containing a large proportion of lead, requiring to be cupelled in a large muffle furnace; the total weight of these deposits before melting was 28,692.27 troy ounces and after melting and cupelling 13,792.45 troy ounces, showing a loss by melting and cupellation of 51.930 per cent.

The average loss in melting all other bullion deposits, viz., 133,914.29 troy ounces before melting and 131,517.28 troy ounces after melting, was 1.790 per cent.

The loss in weight by assaying (base and parted silver) was 30.12 troy ounces, making the weight of bullion after melting and assaying 145,279.61 troy ounces, the average fineness of same being 838 $\frac{1}{2}$ gold and 131 silver.

The net value of the gold and silver contained in deposits was \$2,524,337.58, and was received from the following sources:

	Number of deposits	Before melting and assaying	After melting and assaying	Net value	
		Troy ozs.	Troy ozs.	\$	cts.
Bars, nuggets and dust, amalgam, etc.—					
British Columbia.....	680	121,827.30	105,995.60	1,925,122	21
Yukon territory.....	412	32,686.16	32,010.41	537,821	66
Alaska.....	6	164.36	155.96	2,769	62
Alberta.....	1	85.10	84.99	1,468	35
Dental and jewellery scrap—					
British Columbia.....	508	6,323.79	5,707.71	45,024	91
Alberta.....	99	800.38	694.09	7,166	42
Saskatchewan.....	30	325.76	262.63	3,126	89
Manitoba.....	16	393.71	368.22	1,837	52
	1,752	162,606.56	145,279.61	2,524,337	58

DRAUGHTING DIVISION

H. E. Baine, Chief Draughtsman, reports:

Maps published during the fiscal year ending March 31, 1927, and listed in the catalogue of Mines Branch publications, are as follows:

Map No. 171, Sudbury nickel region; scale, 1 mile to 1 inch.

" 680, Main gas fields and pipe-lines in Alberta; scale, 35 miles to 1 inch.

" 681, Gas and oil fields and pipe-lines in southwestern Ontario; scale, 12½ miles to 1 inch.

" 647, Sodium sulphate occurrences in the western provinces, Canada.

" 648, Muskiki Lake sodium sulphate deposits, Saskatchewan.

" 649, Frederick Lake sodium sulphate deposits, Saskatchewan.

" 650, Chain Lake sodium sulphate deposits, Saskatchewan.

" 651, Snakehole Lake sodium sulphate deposits, Saskatchewan.

" 652, Corral Lake sodium sulphate deposits, Saskatchewan.

" 653, Ingebright sodium sulphate deposit No. 1, Saskatchewan.

" 654, Berry Lake (Viscount) sodium sulphate deposits, Saskatchewan.

" 655, Sybouts Lake sodium sulphate deposit No. 1, Saskatchewan.

" 656, Ceylon Lake sodium sulphate deposits, Saskatchewan.

" 657, Whiteshore Lake sodium sulphate deposits, Saskatchewan.

" 658, Vincent Lake sodium sulphate deposits, Saskatchewan.

" 659, Regina Beach sodium sulphate deposit No. 1, Saskatchewan.

" 660, Regina Beach sodium sulphate deposit No. 2, Saskatchewan.

" 661, Horseshoe Lake sodium sulphate deposit, Saskatchewan.

" 662, Boot Lake sodium sulphate deposit, Saskatchewan.

" 663, Grandora Lake sodium sulphate deposit No. 1, Saskatchewan.

" 664, Grandora Lake sodium sulphate deposit No. 2, Saskatchewan.

" 665, Sybouts Lake sodium sulphate deposit No. 2, Saskatchewan.

" 666, Alsask Lake sodium sulphate deposit, Saskatchewan.

" 667, Metiskow Lake sodium sulphate deposit, Alberta.

" 668, Ingebright Lake sodium sulphate deposit No. 2, Saskatchewan.

Three hundred and one page maps, drawings, charts, and flow-sheets were prepared during the year.

Eleven page maps were prepared to accompany a report for the Second Empire Mining and Metallurgical Congress.

Eight hundred and three negatives, and black and white prints, were made from the photostat machine.

Six hundred and fifty-nine negatives, black and white, and blue prints were made from the blue-print machine.

Three hundred and forty-four half-tone blocks and zinc cuts were received, sent out, and filed during the year.

DISTRIBUTION OF PUBLICATIONS

G. W. Richardson reports:

During the fiscal year ending March 31, 1927, the distribution of Mines Branch reports, bulletins, maps, memoranda series, press bulletins, lists of mine operators, etc., amounted to 41,312 copies. Excluding 12,350 copies sent to the British Empire Exhibition during the summer of 1925, the distribution during the past fiscal year represents an increase of 13,252 copies over the distribution of the previous fiscal year. The details of distribution were as follows:

Mailing lists.....	15,556
Casual requests for reports.....	10,509
Casual requests for maps, bulletins, memoranda series, lists of mine operators, etc.....	15,247
Total.....	41,312

7,250 notification cards were sent out during the year.

A revised edition of the Catalogue of Mines Branch Publications, and a reprint edition of Map No. 171, Geological map of Sudbury nickel region, Ont., scale 1 mile to 1 inch, were published and are available for distribution.

LIBRARY

Mrs. O. P. R. Ogilvie, Librarian, reports:

Accessions to the Library, 1926:

Books (by purchase).....	275
Books (by gift).....	53
Books (bound).....	433
Canadian Government documents (by exchange).....	1,656
British and foreign Government documents (by gift and exchange).....	1,283
Scientific societies, bulletins, proceedings and transactions (by gift and exchange)	1,090
Pamphlets (by gift).....	53
Trades catalogues (by gift).....	341
Maps (by gift).....	37

Accessions to the Library during 1926 were appreciably greater than in 1925. The continued general growth of the Library so far exceeded the shelving accommodations that entire reorganization became necessary and was undertaken during the year. The moving of every book in the Library was involved in such an undertaking.

New stacks were added, thereby increasing the shelving capacity. Suitable shelves were installed in the special "Periodical Room" provided last year and here continuations and periodicals were filed for reference. In consequence of this specific work the temporary service of another assistant was secured.

A large stack room was further provided and suitably shelved for storing publications of the various Geological Surveys of the world, and such other files of Government documents that are exceedingly valuable, but that are less frequently consulted than the many new books and continuations in constant demand.

Although great progress was made toward this reorganization during the year, further labour will be required before entire readjustment becomes an accomplished fact.

A revision of alphabetizing the card catalogue was almost completed and many improvements were inaugurated in the classification and cataloguing during the year.

EXPLOSIVES DIVISION

Lt.-Col. G. Ogilvie, Chief Inspector of Explosives

Explosives Factories

In the course of the year ending March 31, 1927, licences were issued for three new factories. One of these covered the operation of a small temporary factory opened by the Mexco Company at Silver Centre, Ont., for the manufacture of "Klorex" explosives. This factory has since been closed and the company is about to resume operations at Swastika, Ont. A licence was also granted to the New Brunswick Gas and Oilfields Co., Moncton, N.B., in respect to a plant established near Hillsboro, as a temporary measure, for the preparation of nitroglycerine at the oil-field. The third licence was for a small fire-works factory brought into operation by Bernardo Marroni at St. Pierre, Que.

One licence, that for the factory of the Northern Explosives, Limited, at Dragon, Que., lapsed. This plant was closed in December, 1926, following the acquisition of the company by the Canadian Explosives, Limited. Operations were resumed at the Nobel (Ont.) factory of the latter company in January, 1927.

The production of commercial explosives continues to show an increase, that for the calendar year 1926 being 4 per cent in excess of the production in 1925, for which year, it may be recalled, an increase of 15 per cent has been recorded.

A fatal accident occurred in the factory of the Dominion Cartridge Company at Brownsburg, Que., on March 4, 1927. An employee was engaged in waterproofing electric detonators when a bundle of these exploded while he was removing them from the barrel containing the waterproofing solution. The explosion was most probably caused by an inadvertent blow. By the initial explosion, the unfortunate man received injuries to which he soon succumbed. The explosion also caused further detonations and an outbreak of fire which destroyed part of this section of the factory. Three other employees were injured. This accident formed the subject of a special report.

Magazines

The number of magazines under licence on March 31, 1927, was 141, and 152 were operating under temporary magazine licences.

No explosion, fire, or accident occurred in or in connexion with the operation of any magazine, but three magazines were broken into, and from two, explosives were stolen.

In several cases the inspection of magazines by inspectors of this division, and by deputy inspectors of the Royal Canadian Mounted Police, disclosed conditions calling for immediate rectification, which was effected, but in two instances the licencees were prosecuted, convicted, and fined for having explosives in their magazines in excess of the maximum allowed in accordance with the terms of licence.

Explosives Condemned

About 30 pounds of explosives and 200 detonators were found; some of these had evidently been left cached, by their owners, and forgotten. Other stray cartridges and detonators, which had undoubtedly been lost and disregarded by parties using explosives, were picked up by, or handed to, the police. Such explosives were destroyed. Approximately 21,500 pounds of blasting explosives and 5,000 detonators, distributed over 16 magazines or stores, were found on inspection to be in a deteriorated condition and destroyed.

Conditions of unlicensed premises are, in the main, commensurate with the frequency of inspection. In some cases failure to comply with the regulations after full instructions had been given have made prosecution necessary to the enforcement of the regulations—but these are exceptional. Re-inspection, without too long an interval, has been made possible by the activities of the Royal Canadian Mounted Police in all districts covered by the patrols of that force. In some districts, special patrols have been sent out to reach points not normally visited, and have thus given most valuable assistance which has enabled steady progress to be made in the promotion of the safe keeping of explosives as required by the regulations. The actual number of inspections made was approximately the same as in the previous year—700 by inspectors of the division and 2,000 by deputy inspectors of the Royal Canadian Mounted Police.

Prosecutions

Prosecutions for violation of the regulations in relation to the keeping of explosives in unlicensed premises were entered in twenty cases. With the exception of one, in which a charge of unlawful keeping had been laid, convictions were obtained in all. Of these, eleven were for failure to keep explosives in locked receptacles, four for failure to keep blasting cartridges separate from detonators, three for failure to keep records of receipts and issues of explosives, and one for keeping explosives in excess of the quantity allowed in unlicensed premises.

Importations

The number of permits for importation granted during the year was 658, including 50 special permits. The only difficulty experienced in the control of the importation of explosives has been in connexion with Chinese firecrackers. This is due to the persistent shipping, both direct to Canadian importers and through agents in the United States, of firecrackers in which unauthorized composition has been used. In spite of frequent warnings by the importers Chinese shippers have continued such shipments. The examination of the firecrackers necessary to check this practice involves many chemical analyses, and the rejections made have greatly increased. Over eight tons of firecrackers were re-exported.

Authorization of Explosives

Application was made for the authorization of 23 explosives other than fireworks, and 20 were approved after examination. Samples taken of current manufacture showed adherence to the composition of the original samples.

Accidents

Information was obtained of accidents with explosives in all circumstances and these, for the year 1926, have been classified and published in the Annual Report for the division. That the publicity so given is appreciated by many interested in the prevention of accidents, is evinced by the increasing number of correspondents to whom the division is indebted for information regarding accidents. This information is a valued addition to that gleaned from the press, from official sources, and by direct inquiry.

Playing with explosives is still the prime cause of accident, and the most difficult to prevent. Insistence on security of keeping is this division's policy, but it is difficult in the case of occasional users, and impossible where small quantities are kept at home. Steps are being taken, in collaboration with educational authorities, to have school children cautioned in the matter. Illustrated leaflets have been issued to facilitate this and it is reasonable to hope that these may be productive of good results, since it is to be noted that the great majority of the accidents have occurred in places where explosives were comparatively little used and known.

EDITORIAL DIVISION

F. Nicolas, *Editor-in-Chief*

The strength of the English publication section of the Editorial Division remained unchanged during the fiscal year ending March 31, 1927, but the death of Mr. J. Paradis, of the translation section, necessitated a reorganization of that section. Mr. P. E. Levesque has been placed in charge of translation and Mr. J. H. Lemieux was attached, temporarily, as senior translator.

Miss M. Y. Trudel has been transferred from the Departmental Administrative Division to perform the secretarial duties of the Editor-in-Chief's office.

During the fiscal year twenty-nine separate English publications were issued by the department, consisting of annual reports, memoirs, bulletins, and pamphlets; there were issued also thirteen lists of mine operators and mines. Five reports were published in French.

At the end of the fiscal year there were in the hands of the King's Printer eight English reports and two French translations of the Geological Survey, six English reports of the Mines Branch, and one English report of the Explosives Division. Several reports, also, were being edited preparatory to dispatch for printing, and several French translations are now nearly ready for the printer.

The following list includes the publications issued by the various branches of the department during the fiscal year, under the supervision of the Editor-in-Chief, and the French publications distributed¹ during that period:

DEPARTMENT OF MINES

Report
No.

English Publications

2116. *Report of the Department of Mines for the Fiscal Year ending March 31, 1926*; 79 pages; 3,000 copies; published December 9, 1926.

French Translations

2090. *Rapport du Ministère des Mines pour l'année se terminant le 31 mars, 1925*; 77 pages; 1,000 copies; published July 8, 1926.

GEOLOGICAL SURVEY

English Publications

2065. *Economic Geology Series 1. Geology and Economic Minerals of Canada*—by G. A. Young; 187 pages, and appendix, 57 pages; 38 plates; 1 figure; 2 maps; 5,000 copies; published May 6, 1926.
2079. *Memoir 147. Geological Series 127. Michipicoten Iron Ranges*—by W. H. Collins, T. T. Quirke, and Ellis Thomson; 175 pages; 9 plates; 15 figures; 2 maps; 2,500 copies; published May 5, 1926.
2082. *Bulletin 42. Geological Series 45. Contributions to Canadian Palæontology*—by H. W. Shimer, E. W. Berry, F. H. McLearn, and F. Springer; 132 pages; 24 plates; 1 figure; 1,500 copies; published August 9, 1926.
2083. *Memoir 144. Geological Series 128. Mount Albert Map-Area, Quebec*—by F. J. Alcock; 75 pages; 6 plates; 5 figures; 1 map; 2,000 copies; published May 14, 1926.
2088. *Memoir 148. Geological Series 129. Geology and Mineral Deposits of Windermere Map-Area, B.C.*—by J. F. Walker; 69 pages; 8 plates; 3 figures; 1 map; 2,300 copies; published June 30, 1926.

¹ The distribution of English publications was made as usual by the branches that prepared them.

Report
No.

2091. *Summary Report of the Geological Survey, Department of Mines, for the Calendar Year 1924, Part C*; 268 pages; 8 plates; 28 figures; 5 maps; 3,500 copies; published July 29, 1926.
Separate: *Gunflint Iron-bearing Formation, Ontario*—by J. E. Gill; 60 pages; 4 figures; 300 copies; published September, 1926.
2092. Economic Geology Series 2. *Talc Deposits of Canada*—by M. E. Wilson; 149 pages; 14 plates; 19 figures; 2,500 copies; published June 8, 1926.
2093. Economic Geology Series 3. *Iron Ores of Canada, Volume I, British Columbia and Yukon*—by G. A. Young and W. L. Uglow; 253 pages; 44 figures; 5,500 copies (3,000 of which for the Department of Mines of British Columbia); published January 19, 1927.
2095. Memoir 149. Geological Series 130. *Placer and Vein Gold Deposits of Barkerville, Cariboo District, B.C.*—by W. A. Johnston and W. L. Uglow; 246 pages; 25 plates; 32 figures; 1 map; 2,500 copies; published January 24, 1927.
2100. Bulletin 44. Geological Series 46. *Contributions to Canadian Palæontology*—by A. E. Wilson, Charles Schuchert and J. Doris Dart, G. S. Hume, A. F. Foerste, C. M. Sternberg, and F. H. McLearn; 149 pages; 25 plates; 4 figures; 1 map; 1,500 copies; published January 17, 1927.
2101. Memoir 150. Geological Series 131. *Whitehorse District, Yukon*—by W. E. Cockfield and A. H. Bell; 63 pages; 8 plates; 1 map; 2,000 copies; published January 19, 1927.
2113. *Summary Report of the Geological Survey, Department of Mines, for the Calendar Year 1925, Part A*; 248 pages; 5 plates; 13 figures; 7 maps; 3,000 copies; published January 28, 1927.
2114. *Summary Report of the Geological Survey, Department of Mines, for the Calendar Year 1925, Part B*; 46 pages; 1 figure; 2 maps; 3,000 copies; published February 8, 1927.
Publications of the Geological Survey and National Museum of Canada; 14 pages; 1,000 copies; published in March, 1927.

French Translations

2073. Mémoire 136. Série géologique 117. *Régions d'Arnprior-Quyon et de Maniwaki, Ontario et Québec*—by M. E. Wilson; 162 pages; 12 plates; 17 figures; 4 maps; 1,000 copies; published November 30, 1926.
2080. Mémoire 141. Série géologique 120. *Géographie et Géologie du District du Lac Melville, presqu'île du Labrador*—by E. M. Kindle; 111 pages; 17 plates; 10 figures; 800 copies; published March 15, 1927.

NATIONAL MUSEUM OF CANADA

2053. Museum Bulletin 41. Biological Series 10. *Birds of Western Canada*—by P. A. Taverner; 380 pages; 84 double, coloured plates; 315 figures; 15,000 copies; published September 14, 1926.
2089. Museum Bulletin 43. Biological Series 11. *List of Mushrooms and Other Fleshy Fungi of the Ottawa District*—by W. S. Odell; 15 pages; 1 plate; 1,700 copies; published June 7, 1926.
2102. Museum Bulletin 45. Biological Series 12. *List of the Quaternary and Tertiary Diatomaceæ from Deposits of Southern Canada*—by C. S. Boyer; 26 pages; 2,000 copies; published November 20, 1926.

MINES BRANCH

English Publications

624. *Catalogue of Mines Branch Publications* (14th edition); 47 pages; 2,500 copies; published January 26, 1927.
Price List of Mines Branch Publications; 8 pages; 500 copies; published October 2, 1926.
632. *Bituminous Sands of Northern Alberta; Occurrence and Economic Possibilities. Report of Investigations to the end of 1924*—by S. C. Ellis; 244 pages; 43 plates; 47 figures; 8 maps and 4 section sheets; 5,200 copies; published September 22, 1926.

Report
No.

641. Final Report of the Peat Committee appointed jointly by the Governments of the Dominion of Canada and the Province of Ontario: *Peat: Its Manufacture and Uses*—by B. F. Haanel; 298 pages; 58 plates; 46 figures; 5,500 copies (1,500 for the Ontario Department of Mines); published June 2, 1926.
646. *Sodium Sulphate of Western Canada: Occurrence, Uses, and Technology*—by L. H. Cole; 160 pages; 15 plates; 16 figures; 22 maps; 5,000 copies; published October 22, 1926.
669. *Investigations of Mineral Resources and the Mining Industry, 1925*; 84 pages; 4,000 copies; published November 3, 1926.
670. *Investigations in Ore Dressing and Metallurgy, 1925*; 123 pages; 4 plates; 9 figures; 4,000 copies; published January 8, 1927.
672. *Investigations in Ceramics and Road Materials, 1925*; 35 pages; 3,500 copies; published November 29, 1926.
679. *Helium in Canada*—by R. T. Elworthy; 64 pages; 2 plates; 2 maps; 4,000 copies; published March 15, 1927.

Lists of Mines and Mine Operators in Canada:

- Mica; 1,000 copies; published May 3, 1926.
- Copper-Nickel Mines; 1,000 copies; published May 3, 1926.
- Silver Mines; 1,000 copies; published May 3, 1926.
- Salt Wells or Mines; 1,000 copies; published May 3, 1926.
- Silver-Lead-Zinc Mines; 1,000 copies; published May 10, 1926.
- Gold Mines; 1,000 copies; published May 14, 1926.
- Milling Plants; 1,000 copies; published May 9, 1926.
- Manufacturers of Clay Products; 1,500 copies; published October 8, 1926.
- Producers of Mineral Pigments; 500 copies; published August 14, 1926.
- Miscellaneous Non-Metallic Minerals; 500 copies; published September 10, 1926.
- Metallurgical Works; 500 copies; published October 14, 1926.
- Coal Mines; 2,000 copies; published March 1, 1927.
- Natural Gas and Petroleum Wells; 1,500 copies; published October 2, 1926.

EXPLOSIVES DIVISION

Report
No.*English Publications*

19. *Annual Report of the Explosives Division of the Department of Mines for the Calendar Year 1925*; 19 pages; 2,000 copies; published May 20, 1926.

French Translations

18. *L'Emmagasinage des Explosifs*. Pamphlet—by Lt.-Col. G. Ogilvie; 23 pages; 6 figures; 2,000 copies; published May 6, 1926.
20. *Rapport annuel de la Division des Explosifs du Ministère des Mines pour l'année civile 1925*; 19 pages; 1,000 copies; published October 23, 1926.

DISTRIBUTION OF FRENCH PUBLICATIONS

The French publications of the Department of Mines, including those of the Geological Survey, the Mines Branch, and the Explosives Division, are distributed by the Editorial Division of the Department, the distribution being under the direct supervision of P. E. Levesque, who is also in charge of the translation section of the Editorial Division. During the fiscal year 1926-27, 6,682 copies were distributed in Canada and foreign countries, as follows: 1,854 to addresses on the mailing lists, through the Printing Bureau Distribution Office; 2,828 copies in compliance with written or personal requests, distributed from our distribution office; and approximately 2,000 copies of the publications issued by the Explosives Division and the Dominion Fuel Board were sent by these offices to their correspondents, not including, however, the distribution of a card on "How to Burn Coke", the French edition of which was 50,000 copies.

ACCOUNTING DIVISION

ACCOUNTANT'S STATEMENT

P. R. Marshall

The funds available for the work and expenditure of the Department of Mines for the fiscal year ending March 31, 1927, were:

	Grant	Expenditure	
		Amount	Total
	\$ cts.	\$ cts.	\$ cts.
DEPARTMENT—			
Amounts voted by Parliament.....	131,874 00		
Civil Government salaries.....		70,063 80	
Grant to Second Empire Mining and Metallurgical Congress.....		25,000 00	
Grant to Imperial Institute.....		12,848 00	
Expenses of the Explosives Division.....		8,693 31	
Civil Government contingencies.....		3,956 16	
Grant to Canadian Institute of Mining and Metallurgy.....		3,000 00	
			123,561 27
Balance unexpended and lapsed.....			8,312 73
GEOLOGICAL SURVEY—			
Amounts voted by Parliament.....	631,755 02		
Civil Government salaries.....		274,605 59	
Explorations, surveys, and investigations.....		194,550 30	
Publication of reports and maps.....		55,000 00	
Wages.....		18,805 11	
Sundry printing and stationery.....		14,549 17	
Museum equipment.....		10,892 29	
Miscellaneous.....		10,059 23	
Laboratory.....		2,206 48	
Instruments and repairs.....		2,020 89	
Specimens for Museum.....		1,846 94	
Photographic supplies.....		1,356 15	
Miscellaneous gratuities.....		830 00	
Advances 1926-27 to be accounted for in 1927-28.....		432 32	
			587,154 47
Balance unexpended and lapsed.....			44,600 55
MINES BRANCH—			
Amounts voted by Parliament.....	506,383 64		
Civil Government salaries.....		164,696 89	
Expenses of fuel testing plant and laboratory.....		40,863 25	
Expenses of ore dressing and metallurgical laboratories.....		37,600 91	
Investigation of mineral resources and deposits.....		26,664 00	
Expenses of operating peat bog at Alfred.....		22,898 27	
Expenses of Dominion Fuel Board.....		19,405 15	
Chemical laboratories.....		14,837 31	
Publication of reports and maps.....		11,764 78	
Wages.....		11,210 70	
Sundry printing and stationery.....		7,037 33	
Miscellaneous.....		2,625 08	
Compensation to J. H. Fortune for quarters vacated.....		400 00	
Advances 1926-27 to be accounted for in 1927-28.....		1,266 89	
			361,270 56
Balance unexpended and lapsed.....			145,113 08
DOMINION OF CANADA ASSAY OFFICE—			
Amounts voted by Parliament.....	26,000 00		
Earnings.....	282 00		
Salaries of staff.....		17,817 50	
Assayers' supplies.....		1,499 10	
Contingencies.....		910 63	
Premium on bonds.....		445 50	
Electric burglar alarm service.....		360 00	
Platinum assays.....		204 78	
			21,237 51
Balance unexpended and lapsed.....			4,994 49
	1,296,244 66		1,296,244 66

DEPARTMENT OF MINES

Summary

	Grant		Expenditure		Grant not used	
	\$	cts.	\$	cts.	\$	cts.
Civil Government salaries.....	548,375	00	509,366	28	39,008	72
Department.....	57,549	00	53,497	47	4,051	50
Geological Survey.....	331,915	02	311,698	88	20,196	14
Mines Branch.....	331,343	64	196,573	67	134,769	97
Dominion of Canada Assay Office.....	\$26,000	00				
Earnings.....	232	00				
	26,232	00	21,237	51	4,994	49
Miscellaneous gratuities.....	830	00	830	00		
	1,296,244	66	1,093,203	81	203,020	82

Casual Revenue

Sales of equipment, explosives permits, publications, school collections, etc..	\$ 7,357	52
Profits from sale of bullion.....	975	17
Drawback on alcohol.....	367	54
Fines for violation of Explosives Act.....	260	85
	<u>\$ 8,961</u>	<u>08</u>

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