

DOMINION OF CANADA

REPORT

OF THE

DEPARTMENT OF MINES

FOR THE

FISCAL YEAR ENDING MARCH 31, 1929



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DOMINION OF CANADA

REPORT

OF THE

DEPARTMENT OF MINES

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

FOR THE

MAY IT PLEASE YOUR EXCELLENCY:

FISCAL YEAR ENDING MARCH 31, 1929



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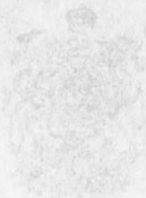
REPORT

OF THE

DEPARTMENT OF MINES

FOR THE

FISCAL YEAR ENDING MARCH 31, 1939



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## CONTENTS

	Page
Department of Mines .....	1
Geological Survey .....	9
Geological Branch .....	9
Topographical Division .....	15
Mineralogical Division .....	17
Palaeontological Division .....	19
Surveying Division .....	20
Exploring and Reproducing Division .....	22
Photographic Division .....	23

*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, 1929.

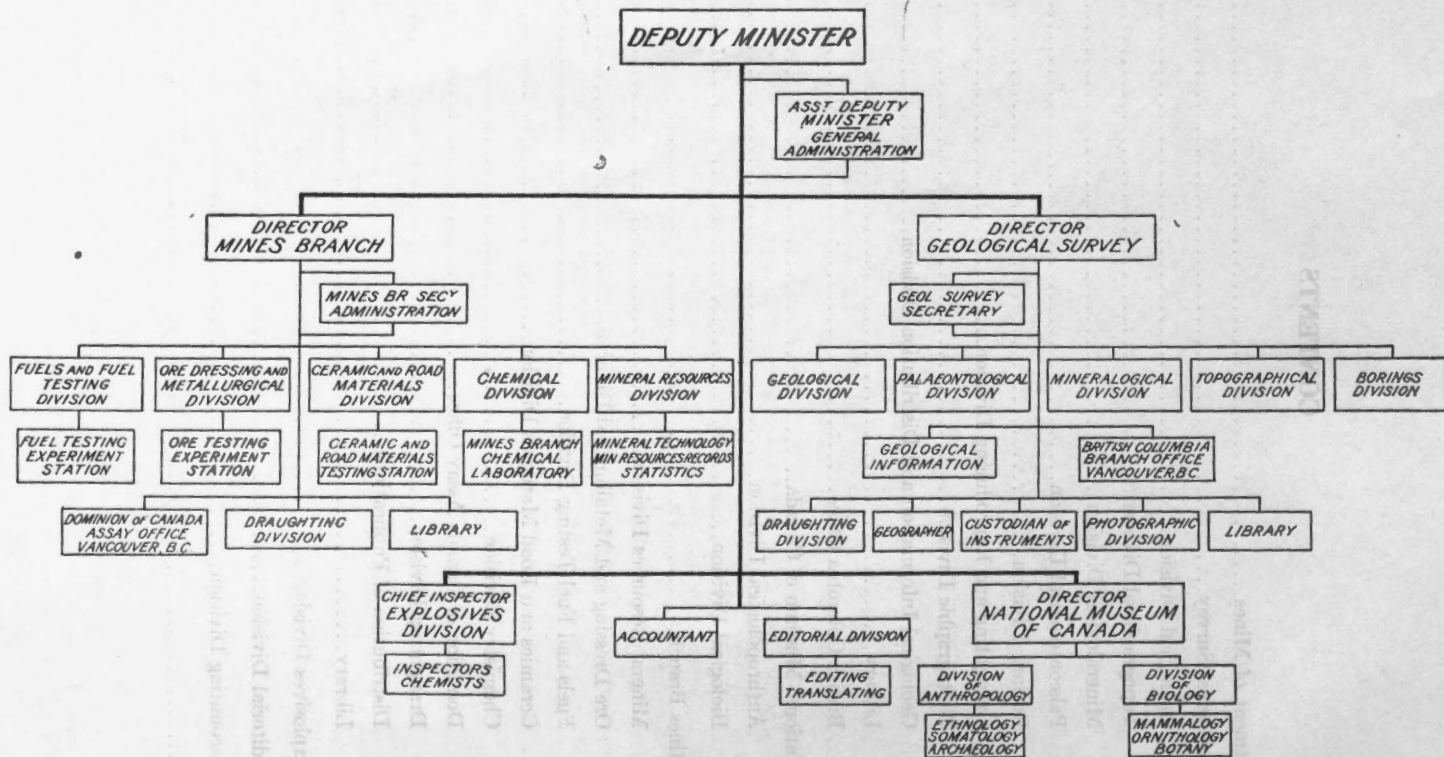
**CHARLES STEWART,**  
*Minister of Mines.*



## CONTENTS

	PAGE
Department of Mines.....	1
Geological Survey.....	9
Geological Division.....	9
Topographical Division.....	15
Mineralogical Division.....	17
Palæontological Division.....	19
Borings Division.....	20
Draughting and Reproducing Division.....	22
Photographic Division.....	26
Geological Information and Distribution Division.....	26
Library.....	27
British Columbia Office.....	28
National Museum of Canada.....	29
Anthropological Division.....	29
Biological Division.....	31
Mines Branch.....	34
Mineral Resources Division.....	35
Ore Dressing and Metallurgical Division.....	37
Fuels and Fuel Testing Division.....	39
Ceramics and Road Materials Division.....	42
Chemistry Division.....	44
Dominion of Canada Assay Office.....	45
Draughting Division.....	46
Distribution of Publications.....	47
Library.....	47
Explosives Division.....	48
Editorial Division.....	50
Accounting Division.....	54
Index.....	57

ORGANIZATION CHART  
DEPARTMENT OF MINES



1A

DEPARTMENT OF MINES

**REPORT**

OF THE

**DEPARTMENT OF MINES**

FOR THE FISCAL YEAR ENDING MARCH 31, 1929

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

SIR,—I have the honour to submit, in accordance with the requirements of Parliament, the Annual Report of the Department of Mines for the year ending March 31, 1929.

The growth of the mining and metallurgical industries, which has been so prominent a feature in the economic development of the Dominion in recent years, continued during the year under review and, as in the past few years, the demands for technical advice on problems arising in the development of our mineral resources have continued to increase both in number and variety. Field and laboratory investigations by the scientific and technical branches of the department have been extended to meet these conditions as far as available facilities have permitted, and the foundations laid for greater expansion within the next few years. The increasing importance of mining in the industrial life of the country is each year becoming more evident and, although a large amount of scientific and technical research is already being carried on both by the Dominion and Provincial governments to further the development of mining, still broader efforts must be made to secure for Canada the greatest benefit from this important source.

The functions of the various branches and divisions of the Department, and the more important operations carried on during the year, are summarized below by the heads of each branch and division. As in the past, the special attention paid to the immediate and more urgent requirements of the mining and metallurgical industries has taken up almost the entire time and facilities available in 1928-29. Progress was made, however, towards the completion of the new Fuel Research Laboratories building in Ottawa, which was ready for occupancy in the early part of 1929-30. A commencement was made on the construction and equipment of a pyro-metallurgical laboratory for research investigations on iron ores, ferro alloys, and their products, and it is anticipated that the work to be undertaken in this laboratory will afford material assistance to the Canadian iron and steel industry. During the year a preliminary investigation was undertaken by the Geological Survey to ascertain the practicability of the various types of apparatus for electrical and electro-magnetic prospecting now being used in Canada and the United States. This investigation has been continued and expanded in 1929-30.

During the year the Geological Survey had fifty-three field parties engaged in geological and topographical mapping and related work, operating in widely separated parts of the Dominion. Other investigations of economic and scientific interest were carried on in different parts of the country by the Mines



Branch and the National Museum of Canada. Laboratory investigations embraced a wide range of subjects in the fields of mineralogy and petrography, well-borings, ore-dressing and metallurgy, fuel testing, ceramics, and road materials. The work in fuel testing has been marked during the year by a revival of interest in the possibilities of pulverized fuels, and equipment is being provided in the new Fuel Research Laboratories to permit of a variety of tests being made with Canadian fuels. Peat manufacturing experiments were conducted at Alfred, Ontario, as planned, to determine the feasibility of manufacturing peat fuel on a commercial basis, but were handicapped by the abnormally heavy rainfall during the field season.

As in former years, the general policy of co-operation with other departments of the Dominion and of provincial Governments, with the development branches of the railway companies and other Canadian organizations interested in the development of our natural resources, has been maintained. Close co-operation with such organizations is beneficial in many ways, notably in eliminating the danger of duplication and overlapping. The investigations usually undertaken by the Department differ distinctly from those conducted by other bodies, but where similar work is carried on—as in some of the universities, the provincial mines organizations, and the National Research Council—every effort is made to co-ordinate the work of the Department with that of these various bodies. The fundamental principle governing this matter lies in the fact that an organization such as a federal department can continually employ a greater number of specialists than the smaller local organizations, and because of the greater territory within its sphere of operations, the larger staff can always be kept busy. Moreover, the mineral industry presents, at all times, aspects of vital national concern upon which the Dominion Government must keep informed, and a considerable share of the investigations undertaken by the Department are of interest and practical value outside the province in which they may be made. Close co-operation was maintained during the year with the Imperial Institute (London), the British Department of Scientific and Industrial Research, the United States Department of Commerce at Washington, and with certain scientific and technical societies in the United States.

The Deputy Minister, in addition to his administrative duties, devoted 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; Canadian Committee of the World Power Conference; Advisory Committee on Mining Regulations; National Research Council and several of its associate committees; Niagara Board; Advisory Committee on Minerals of the Imperial Institute. Meetings of each of these bodies were held during the year. The work of the Niagara Board to determine means by which the scenic beauty of the falls and rapids of Niagara can be best maintained and the quantity of water that may be diverted consistently therewith was completed by the signing, on January 2, 1929, at Ottawa, of the treaty between the Dominion of Canada and the United States of America on this important matter. Contact with current mining developments throughout the Dominion was maintained during the year. For this purpose visits were made by the Deputy Minister to mining and metallurgical centres throughout the country, including an extensive tour in the autumn to examine important developments in western Canada. In June, 1928, the Assistant Deputy Minister visited districts in Nova Scotia in which coal and metal mining is being carried on.

The mining newsletter service prepared primarily for distribution from the High Commissioner's Office in London, is now in its sixth year and has proved an excellent medium for the presentation overseas of news concerning Canada's mining industry. This fortnightly service reaches some four hundred selected recipients in the United Kingdom and on the Continent, including the more

important mining, banking, and investment houses, and the trade and technical periodicals. The articles are widely reproduced and help to sustain interest in Canadian mining matters. The titles of the twenty-nine articles dispatched during the year will be found on page 8.

Although the results of all major investigations conducted by the Department are published in the form of summary reports of investigations, special bulletins, maps, memoirs, etc., much information of scientific, technical, and current interest dealing with or related to the work of the Department is also disseminated through the technical and public press, and by means of addresses given by members of the staff. A selection of these papers and addresses is listed on pages 6 to 8. The lectures on our natural resources, which have become a feature of the museum work in Ottawa during the winter months, were continued during the winter of 1928-29 and were again favourably received.

Canada's mining industry has seldom shown such phenomenal growth as in 1928, during which the previous high mineral records of 1926 and 1927 were far surpassed. The value of the total mineral output of the Dominion for 1928 is estimated at \$275,000,000, nearly 11.2 per cent over the 1927 output, with advances featuring all fields of production. Canada's mining industry, it is said, now represents a capital investment of more than \$700,000,000 and employs 85,000 workers in mining operations and associated enterprises. Outstanding features during the year include a considerable increase in the copper and gold output as a result of the first year's operations of the Horne (Noranda) mine and smelter in western Quebec; the far-reaching developments proceeding in the copper-nickel industry of Sudbury district; the exploitation of the very large, low-grade copper-zinc-lead ore-bodies that enrich the central Manitoba-Saskatchewan boundary region; the further development of the oil and gas fields of the western provinces, notably in Turner valley, Alberta; and the increased activity, both in mining and metallurgy, in British Columbia.

The various developments in metallic mining have resulted, during the past year, in attracting wide attention to Canada's large base-metal resources. Copper is the outstanding factor in this field, production in 1928 amounting to over 100,000 tons, an advance of more than one-third over the 1927 output. A similarly large increase was shown in the production of nickel, and important advances were made in the output of lead and zinc. Although these advances are in themselves very satisfactory, it is most significant that, of the more important base-metal discoveries now in process of development, one property only (the Horne mine) has reached the stage of uninterrupted production. The making of a mine in new territory involves not only actual mining development, but also in many cases the building of railways, harnessing of waterpower and erection of transmission lines, and the construction of concentrating or smelting plants. Recent railway construction and power developments in mining territory have exceeded all earlier records, but the processes take time, and years pass before mines can be productive. The output from the more important properties which are expected to commence operations within the next two years will undoubtedly add materially to Canada's total production of these increasingly important metals.

The various major enterprises in railway construction, hydro development, and mining and metallurgical activity proceeding simultaneously in widely separated sections of the Dominion presage a period of wide and intensive mineral development evidently much greater than anything yet experienced in Canada. Future development will undoubtedly be accelerated to a degree hitherto unknown because of the fact that, concurrently with the advances recently made in mining and metallurgy and in methods of railroad building, the science of aviation has reached a stage that enables it virtually to revolutionize prospect-

ing in vast reaches of territory otherwise difficult of access and in which development has heretofore been necessarily slow and laborious. Only those in close contact with field operations in the more remote districts fully realize the important part being played by the airplane. It is difficult to exaggerate the importance of the factor which has reduced distance, hitherto the chief obstacle in the way of mineral development, to terms of flying hours.

As a result of these important developments, an entirely new situation is arising. Up to the present, with very few exceptions, no difficulties have been experienced in finding readily available markets, either at home or abroad, for our entire mineral output. It would seem, however, that mining in Canada will henceforth feature a largely increased output of copper, lead, and zinc. In the last five years the production of copper and lead has been almost doubled, and that of zinc nearly trebled. The present output of these metals is far in advance of domestic requirements and the trend of current developments is to compel Canadian producers to find foreign markets for their products. In 1923 our total exports of non-ferrous metals and their products fell below \$50,000,000. Last year they exceeded \$112,000,000. Not so many years ago the United Kingdom and the United States absorbed almost the entire exportable surplus of these metals, and though sales to the United States and the United Kingdom have continued to increase Canadian producers have had, to a steadily increasing extent, to enter markets outside of these countries. In the past five years our exports of non-ferrous metals to these "Other Countries" rose from \$12,000,000 to more than \$32,000,000.

### **Dominion Fuel Board**

During the year, eleven meetings of the Dominion Fuel Board were held, at which twenty-one subjects appeared on the agenda. A number of sub-committees of the Board also met during this period.

An important part of the work related to Orders in Council of March 16, 1928 (P.C. 439), and of March 30, 1928 (P.C. 539), regarding test movements of Canadian coals from eastern and western Canada to the provinces of Ontario and Quebec, and to the provisions of the latter Order in Council so far as it relates to inland rail shipments of water-borne coal. Competition of foreign coals at the different points in Ontario and Quebec has a direct bearing upon the application of these dispositions, and the situation consequently necessitated a great deal of investigation by the board.

During the year forty-five applications were received under the Order in Council of March 30, 1928 (P.C. 539). The board dealt with applications covering 431,000 tons of coal.

Rail shipments of coal from Nova Scotia to points in the province of Quebec amounted to some 75,000 tons during the period December 15, 1928, to April 1, 1929. This was very helpful to the Canadian coal industry in retaining winter markets.

At the request of the New Brunswick Government a survey of the consumption and distribution of coals used in that province was carried out by the Fuel Board. This is the first time complete information of this nature has been made available.

In the summer of 1928 the chairman and secretary of the board visited the coal fields of both eastern and western Canada to maintain contact with modern mining conditions and with problems related to the transportation and marketing of coal. The board will continue to keep in close touch with this phase of the fuel situation.

Inspection of the construction of a coking plant under the terms of the Domestic Fuel Act, 1928, was made by the board as construction progressed during the year. The results of an investigation initiated by the board during the year of the comparative costs of house heating by coal, fuel oil, and city gas, will soon be available for publication.

The Mineral Resources Division of the Department of Mines again conducted for the Fuel Board the annual survey of domestic fuel consumption in Ontario and Quebec, and in the year under review extended the survey to cover also the province of Manitoba. The board continued the distribution throughout Ontario and Quebec of printed cards and pamphlets showing correct methods of burning coke and other fuels displacing imported anthracite. An increased use of fuels displacing American anthracite was again recorded.

During the year the board published its second progress report, covering operations 1923-28. This summarized the investigations conducted by the board with respect to Canada's fuel problems, reviewed the changes which the fuel situation has undergone during this period, and pointed to the possibilities arising through technical investigation and research for the more efficient and diversified uses of coal. A third edition of 25,000 copies of the board's pamphlet on house insulation was issued during the year to meet the public demand. A companion pamphlet dealing with humidity in houses has also been published.

Statements and information on various phases of the fuel situation were prepared by the board for use by the Advisory Board on Tariff and Taxation, other government departments, and various Canadian coal-mining interests. A great many requests from the public for information respecting fuel and the fuel situation were received. Press articles and addresses on the fuel situation were included in the year's activities.

The Natural Resources Intelligence Service, the Mines Branch, the Geological Survey, the Dominion Water Power and Reclamation Service, and the Dominion Bureau of Statistics freely co-operated with the board.

Your obedient servant,

CHARLES CAMSELL,  
*Deputy Minister.*

OTTAWA, September 30, 1929.

### List of Papers and Addresses

NOTE.—Lists of the papers prepared and addresses delivered during the year by members of the staffs of the Divisions of Anthropology, Biology, and Mineralogy are to be found in the Annual Report of the Director, National Museum of Canada.

#### General

- Recent Developments in the Canadian Mining and Metallurgical Industries, by Hon. Charles Stewart. Edmonton Journal Special Mining Supplement, November 29, 1928.
- The Outlook for Canada's Mining Industries, by Hon. Charles Stewart. Northern Miner, Toronto, Exploration Number, February, 1929.
- Canadian Mining Operations Expand, by Charles Camsell. Financial Times (London), Second Canadian Resources Supplement, June 4, 1928.
- The Status of the Canadian Mining Industry, by Charles Camsell. Canadian Progress, 1928.
- Noteworthy Progress in Canadian Mining Operations, by Charles Camsell. The Empire Mail, August, 1928.
- Canada's Growing Mining Industries, by Charles Camsell. Winnipeg Tribune Financial and Mining Review, October 19, 1928.
- The Mining Industries of Canada, by Charles Camsell. Financial Times (London), Third Canadian Resources Supplement, November, 1928.
- Mining Progress, by Charles Camsell. Montreal Herald National Number, 1928.
- The Mineral Industry in Canada's Growth, by Charles Camsell. Journal of Commerce (New York), January 10, 1929.
- Our Northland, by Charles Camsell. Peterborough Branch, Engineering Institute of Canada, January 24, 1929.
- The Influence of Metals on Canadian History and Development, by Charles Camsell. Queen's University and Toronto University, March, 1929.
- Canada's Mining Industry in 1928, by L. L. Bolton. Montreal Gazette Commercial and Financial Review, January, 1929.
- How the Department of Mines Serves the Public, by L. L. Bolton. Canadian Institute of Mining and Metallurgy, Winnipeg, March, 1929.
- Canada North of 56 Degrees, by E. M. Kindle. Yale Scientific Magazine, May, 1928.
- Canadian Field Naturalist, vol. XLII, No. 3, April, 1928.

#### Geology, Mining, and Mineral Resources

- Economic Geology of Canada, 1927, by Wyatt Malcolm and P. J. Moran. Canada Year Book, Ottawa.
- Present Status and Future Possibilities of the Mining Industry in British Columbia, by Victor Dolmage. Bulletin of the Imperial Institute, London, vol. XXVI, No. 1, 1928.
- Mining Opportunities in Northern British Columbia, by F. A. Kerr. Financial News (Vancouver), January, 1929.
- The Keewatin Iron Formations, by W. H. Collins. Fennia (Helsingfors), vol. 50, 1929.
- A General Summary of Observations on the Sulphide Deposits of Northern Quebec, by H. C. Cooke and W. F. James. Canadian Mining Journal, August 31, 1928.
- Ore Relations at the Horne and Aldermac Mines, Quebec, by H. C. Cooke. Canadian Mining and Metallurgical Bulletin, October, 1928.
- Gaspé Peninsula, Its Geology and Mineral Possibilities, by F. J. Alcock. Report on Mining Operations in the Province of Quebec during the year 1927.
- Origin of Copper Mountain Ores, by V. Dolmage. Canadian Institute of Mining and Metallurgy, Winnipeg, March, 1929.
- Geology and Copper-zinc Deposits of Cold Lake Area, Manitoba, by J. F. Wright. Canadian Institute of Mining and Metallurgy, Winnipeg, March, 1929.
- Recent Mining Developments in Northern Manitoba, by J. F. Wright. Ottawa Branch, Canadian Institute of Mining and Metallurgy, December, 1928.
- The Chibougamau District, Quebec, and the Eagle River Area, Abitibi Territory, Quebec, by J. B. Mawdsley. Report on Mining Operations in the Province of Quebec during the year 1927.

- Recent Geological Investigations in Chibougamau District, Quebec, by J. B. Mawdsley. Canadian Mining and Metallurgical Bulletin, October, 1928.
- Electrical Methods of Prospecting, by J. B. Mawdsley. British Columbia Miner, March, 1929. Vancouver Branch, Canadian Institute of Mining and Metallurgy, January, 1929.
- Semi-precious Labradorite in Canada, by J. B. Mawdsley. Canadian Field Naturalist, January, 1929.
- Developments of Petroleum and Natural Gas in Canada during 1927, by G. S. Hume. Institution of Petroleum Technologists (London), vol. 14, No. 69, August, 1928.
- Oil Developments and Prospects in Canada, by G. S. Hume. O'Shaughnessy's South American Oil Reports, vol. III, No. 9, January, 1929.
- Abrasives, by V. L. Eardley-Wilmot. Mineral Industry for 1927, vol. 36.
- Siliceous Abrasives in Canada, by V. L. Eardley-Wilmot. Engineering, April 27, 1928.
- Diatomite in British Columbia, by V. L. Eardley-Wilmot. British Columbia Miner, February, 1929.
- Diatomite: Its Properties and Use, by V. L. Eardley-Wilmot. Canadian Mining Journal, February 15, 1929.
- Diatoms as an Origin of Oil, by V. L. Eardley-Wilmot. Canadian Mining Journal, January 11, 1929.
- The Production and Marketing of Copper, Lead, and Zinc in Canada, by A. H. A. Robinson. Mail and Empire (Toronto), Annual Mining Review, January 3, 1929.
- The Place of Non-metals in the Mining Industry, by L. H. Cole. Canadian Institute of Mining and Metallurgy, Winnipeg, March, 1929.
- Discovery of Potash Salts in New Brunswick, by L. H. Cole. Dominion Chemical Convention, London, June, 1928.
- The Occurrences, Metallurgy, and Uses of Quicksilver, by V. L. Eardley-Wilmot. Canadian Mining Journal, December 28, 1928.

### *Fuels and Fuel Testing*

- The Bearing of High and Low Temperature Carbonization and Synthetic Fuel Processes on Canada's Fuel Problems, by B. F. Haanel. World Fuel Conference, London, September, 1928.
- The Use of Solid Fuels in the Pulverized State for the Generation of Steam, by E. S. Malloch. Canadian Institute of Mining and Metallurgy, Vancouver, November, 1928.
- Coal Briquetting, by A. J. C. Nettell. British Columbia Miner, November, 1928.
- The Coal Situation from a National Viewpoint, by Charles Camsell. Manitoba Chamber of Mines, April 10, 1928.
- The Test Rate on Alberta Coal to Ontario, by Charles Camsell. Western Canada Coal Review, April, 1928.
- Changes in the Fuel Situation in Canada, by Charles Camsell. Toronto Canadian Club, October 22, 1928.
- The Problem of Canadian Fuel Independence, by F. G. Neate. Queen's Quarterly, December, 1928.
- The Marketing of Canadian Coal, by F. G. Neate. Western Canada Coal Review, October, 1928.
- British Columbia and the Coal Industry, by F. G. Neate. Western Canada Coal Review, October, 1928.
- The Test Movement of Maritime Province Coal, by F. G. Neate. Canadian Railway and Marine World, June, 1928.
- The Fuel Situation, by M. D. McCloskey. Montreal Gazette, December, 1928.
- Markets reached by Canadian Coals, by M. D. McCloskey. Topographical Surveyors Society, Ottawa, February 20, 1929.
- Markets for Nova Scotia Coal in Quebec and Ontario, by M. D. McCloskey. Halifax Herald, October, 1928.

### *Ore Dressing and Metallurgy*

- Electric Steel for Engineering Purposes, by Thomas W. Hardy. Iron Age, December 20, 1928.
- Possibilities for a Home Smelter, by A. J. C. Nettell. British Columbia Miner, November, 1928.
- Some Notes on the History of the Metallurgy of Copper, Zinc, and Lead, by A. J. C. Nettell. British Columbia Miner, March, 1929.

*Ceramics and Road Materials*

- Treatment of Certain Clays to Overcome Drying Defects, by Howells Fr chet te. Canadian National Clay Products Association, June, 1928.
- Correction of an Extreme Case of Cracking in the Drying of Brick, by Howells Fr chet te and J. G. Phillips. American Ceramic Society, February, 1929.
- A New Method of Treating Clays to Overcome Drying Defects, by J. G. Phillips. Canadian Institute of Mining and Metallurgy, March, 1929.
- Methods of using Barium-Carbonate for the Prevention of Scum, by L. P. Collin. Footnotes, December, 1928.

*Physiography and Topography*

- The Age of the Upper Great Gorge of Niagara River, by W. A. Johnston. Transactions Royal Society of Canada, vol. XXII, part 1, sec. IV, March, 1928.
- The Rivers of Gasp , by F. J. Alcock. Bulletin of the Geological Society of America, vol. 39, No. 2, June, 1928.
- Landslides in Canada, by D. A. Nichols. Canadian Field Naturalist, December, 1928.

*Pal eontology*

- A Comparative Study of Different Types of Thermal Stratification in Lakes and Their Influence on the Formation of Marl, by E. M. Kindle. Journal of Geology, February-March, 1929.
- A Crustacean New to the Pleistocene Fauna of Canada, by E. M. Kindle. Canadian Field Naturalist, vol. XLIII, No. 9, December, 1928.
- Notes on a Devonian Plant and Other Observations made on a Visit to Cross Point, Gasp , Quebec, by F. J. Alcock. Canadian Field Naturalist, March, 1929.
- A New Armoured Dinosaur from the Edmonton Formation of Alberta, by C. M. Sternberg. Transactions of the Royal Society of Canada, third series, vol. XXII, sec. IV, 1928.
- Dinosaurs in the National Museum of Canada, by C. M. Sternberg. Civil Service Review, March, 1929.

*Mining Newsletter Series*

(Distributed from the Office of the High Commissioner for Canada in London)

- Mining Developments in Yukon Territory, by W. E. Cockfield.
- The Porcupine Gold Area, by A. Buisson.
- Developments in the Slocan District, B.C., by C. E. Cairnes.
- Discovery of Potash Salts in New Brunswick, by L. H. Cole.
- Field Work of the Geological Survey, 1928, by W. Malcolm.
- Alberta Oil-field Developments in 1927, by G. S. Hume.
- Alberta Bituminous Sands for Paving Purposes, by S. C. Ells.
- Mining in Nova Scotia, by W. Malcolm.
- Silver Mining in Canada, 1927, by V. L. Eardley-Wiknot.
- Mining Activities at Cold Lake, Manitoba, by J. F. Wright.
- The Lure of Canada's Mineral Possibilities, by W. Malcolm.
- Gypsum Industry in Canada Progresses, by L. H. Cole.
- The Search for Oil in Western Canada, by G. S. Hume.
- Progress in the Rouyn Area, Western Quebec, by A. Buisson.
- The New Fuel Research Laboratories, Department of Mines.
- Mining in Nova Scotia, by A. H. A. Robinson.
- The Ribstone Area, Alberta, by G. S. Hume.
- Tin in Oiseau River Area, Manitoba, by J. F. Wright.
- The Copper Situation in Canada, by A. Buisson.
- Geology of Reindeer Lake, by C. H. Stockwell.
- Lead and Zinc in Canada, by A. Buisson.
- Canada's Mineral Industry in the Spotlight, by W. Malcolm.
- Mining in British Columbia in 1928, by V. Dolmage.
- The Gypsum Industry in Canada in 1928, by L. H. Cole.
- Soil Surveys in Canada, by W. A. Johnston.
- The Sheep Creek Area, B.C., by J. F. Walker.
- The Big Bend District, B.C., by H. C. Gunning.
- Metal Mining Activity in New Brunswick, by F. J. Alcock.
- Annual Meeting of the Canadian Institute of Mining and Metallurgy, by W. Malcolm.

## GEOLOGICAL SURVEY

*W. H. Collins, Director*

### CHANGES IN STAFF

The Geological Division lost the services of W. F. James, who resigned on September 23, 1928, to enter the commercial field as a consulting geologist. Dr. James had been on the permanent staff of the Survey for five years, working mostly in Rouyn area. C. S. Evans was appointed assistant geologist on June 8, 1928. A. C. Tuttle was appointed to the Topographical Division as junior topographical engineer on April 1, 1928.

Mr. E. D. Ingall retired on superannuation on November 13, 1928. Mr. Ingall had been continuously connected with the Geological Survey for over forty-four years, his appointment dating from July 1, 1884. His services, which were varied and distinguished, extend over half the period of existence of the Geological Survey. A mining industry was just developing in eastern Canada when he came from England and for the first fifteen years or more he studied such fields as the silver-bearing area around Port Arthur and Fort William, the Bruce Mines copper deposits and the iron ore deposits of eastern Ontario. In 1886 the Geological Survey undertook systematic collection of mineral statistics. This work, begun by Eugene Coste and Mr. Ingall, soon devolved entirely upon Mr. Ingall and was in his charge until 1907, when it was transferred to the Mines Branch and still later (1920) to the Dominion Bureau of Statistics. On relinquishing this work, Mr. Ingall organized and took charge of the important Borings Division of the Survey, for the accumulation of data from oil wells and other deep borings throughout Canada. He continued in charge of this division until he retired. His separation from the Government service has been a source of deep regret not only to his associates in the Geological Survey but to many in other departments.

As a result of the increased demand for geological reports and maps, and the larger number of field parties sent out by the Survey, there has been an even greater increase of work in the Draughting Division. The division undertook, a few years ago, in the absence of trained map draughtsmen, to train apprentices and this plan has been exceedingly satisfactory.

### FIELD WORK

Eight years ago, the Survey sent out forty field parties: by 1928 the parties had increased by fifty-three, of which thirty-seven were engaged upon geological work; fourteen in making maps suitable for all general purposes, though primarily for geological use; and two collecting specimens for the National Museum. A brief account is given of the work of each party in the succeeding sections of this report.

## GEOLOGICAL DIVISION

G. A. Young, Chief Geologist, reports:

### *Yukon*

W. E. Cockfield mapped geologically and topographically the drainage basin of Little Salmon river, southern Yukon. The area examined is 100 miles long by 5 to 20 miles wide. An apparently small deposit of silver-lead ore a few miles from the head of Little Salmon lake indicates that the district is



mineralized and that other deposits of the same type may be present. A report upon the district, accompanied by a geological map, appears in Summary Report 1928, Part A.

*British Columbia*

F. A. Kerr continued topographical and geological mapping of a strip of country along Stikine river below Telegraph Creek. During the past season the work was carried southward to the International Boundary. The area lies on the eastern margin of the Coast Range batholith and contains an assemblage of rock formations favourable for the occurrence of metalliferous deposits. An interim report directing attention to the mineral possibilities of the area is included in Summary Report 1928, Part A.

George Hanson commenced a study of the geology and mineral deposits of Alice Arm and vicinity, near Anyox. The mineral deposits contain silver, lead, zinc, and copper. An account of some of the mining properties is given in Summary Report 1928, Part A.

George Hanson and T. C. Phemister made a detailed study of an area of 140 square miles in the vicinity of Topley on the Canadian National railway about midway between Fort George and Prince Rupert. No previous geological work had been done in the area, but mineral deposits had been found. It was believed that through geological work the favourable metalliferous areas might be outlined. This objective was reached. A report on the area is contained in Summary Report 1928, Part A. A detailed map is in course of preparation.

Victor Dolmage mapped topographically and geologically about 550 square miles of territory lying between Taseko lake and Bridge river, southwestern British Columbia. The main objectives were to evaluate the mineral-bearing possibilities of the district and to solve certain problems relating to the Coast Range batholith with which so much of the mineralization of western British Columbia is connected. Certain areas favourable to the occurrence of minerals were noted. One in particular was recommended to prospectors in the district and, as a result, a promising occurrence of copper ore was found late in the season. An account of the district and a preliminary geological map are published in Summary Report 1928, Part A.

J. R. Marshall, assisted by N. F. G. Davis, concluded a geological and topographical reconnaissance begun last year of the Clearwater Lake map-area. This hitherto unexplored and little prospected area extends from the headwaters of North Thompson river west to Clearwater lake. A memoir and map, setting forth the results of the work in 1927 and 1928, are in course of preparation.

C. E. Cairnes completed the investigation of the many mineral deposits and of the geology of Slocan area, about 390 square miles of territory between latitudes  $49^{\circ} 45'$  and  $50^{\circ}$ , and longitudes  $117^{\circ}$  and  $117^{\circ} 30'$ . A full report on the geology and mineral resources of this important mining area is being prepared and will be accompanied by geological maps, plans and sections of mines, etc. Mr. Cairnes also made a geological reconnaissance of an area stretching from Slocan lake to and across Upper Arrow lake. This work was done for the purpose of solving certain problems of both scientific and economic interest and also to estimate the economic possibilities of the district traversed. A report upon this work, accompanied by a geological map, is included in Summary Report 1928, Part A. In the same report there is a joint account, by Mr. Cairnes and H. C. Gunning, of a large but low-grade zinc property (the Big Ledge (consolidated) property) west of Pingston, Upper Arrow lake.

H. S. Bostock completed geological mapping of an area in southern Okanagan and Similkameen districts, enclosed by longitudes  $119^{\circ} 30'$  and  $120^{\circ}$ , and latitudes  $49^{\circ} 15'$  and  $49^{\circ} 30'$ . The area includes White Lake coal basin, Ollala and Independence Mountain mining camps, and, also, a number of smaller

groups of mineral claims. One important phase of the work was done for the purpose of promoting prospecting and guiding it to the more likely sections. Mr. Bostock also completed the detailed investigation of Hedley mining camp.

J. F. Walker spent most of the field season on a detailed examination of mining properties in the eastern half of Salmo map-area. This area lies south of Nelson, between latitudes  $49^{\circ}$  and  $49^{\circ} 15'$ , and longitudes  $117^{\circ}$  and  $117^{\circ} 30'$ . It includes the Sheep Creek gold camp. Recent developments on zinc properties within the area and the revival of interest in the gold properties created a demand for a detailed study of the mineral resources and general geology. Mr. Walker spent a part of the field season investigating the geology near Crawford bay on the east side of Kootenay lake. As a result of this, and previous work, a geological map of Kootenay Lake district, between longitudes  $116^{\circ} 30'$  and  $117^{\circ}$  and latitudes  $49^{\circ} 30'$  and  $50^{\circ} 30'$  has been prepared. This map and an accompanying report appear in Summary Report 1928, Part A.

H. C. Gunning made a reconnaissance survey of about 1,000 square miles lying north of the main line of the Canadian Pacific railway and within the big bend of Columbia river. The district covered borders Columbia river from Revelstoke northward and extends east to the watershed. All important mineral deposits were studied. They include placer gold, copper, and lead-zinc deposits, with variable values in gold and silver. Tin has also been discovered recently. The lead-zinc deposits are the most important and at present are receiving most attention. A reconnaissance geological map of the area and a report upon the geology and mineral resources are included in Summary Report 1928, Part A.

#### Alberta

X B. R. MacKay made a detailed investigation of the coal-bearing area on the north branch of Hay river in western Alberta, north of the transcontinental line of the Canadian National railways. One result of the field work was the discovery of a coal-bearing belt on the north slope of Hay River valley, extending westward from Thoreau creek. This discovery increases very materially the known coal resources of the district.

X C. S. Evans made a reconnaissance of the foothills area between Bow and Saskatchewan rivers for the purpose of securing fundamental geological information such as is required by those exploring for oil and coal.

#### Saskatchewan

X F. H. McLearn and P. S. Warren collaborated in continuing the revision of the areal mapping, stratigraphy, and structure of southern Saskatchewan. The field being investigated extends from the International Boundary north to latitude 52 degrees, and from longitude 102 degrees to longitude 109 degrees. Mr. McLearn's work, of which a more extended account is given in the report from the Palaeontological Division, lay in the south part of the field. An account of some important results obtained is given in Summary Report 1928, Part B. Mr. Warren during the field season explored about 12,000 square miles in the northern part of the field. He investigated several deposits of economic interest such as volcanic dust beds in the vicinity of Swift Current and elsewhere. A main objective of the work has been to secure all pertinent information regarding the possible existence of gas or oil fields.

X C. H. Stockwell geologically explored Reindeer lake and vicinity, in the northeastern part of the province. An area of 3,500 square miles, partly lying in Manitoba, was geologically surveyed. The zinc-copper deposits on Paskwachi bay were examined. Numerous, large deposits of iron sulphides of, so

far as known, no commercial value were seen. They are of importance as indicating the areas where mineral deposits of commercial value might occur. A geological map and report setting forth the results of the work are presented in Summary Report 1928, Part B.

### Manitoba

J. F. Wright geologically explored an area of about 1,600 square miles in the vicinity of Kississing lake, between longitudes  $100^{\circ} 45'$  and  $102^{\circ}$  and latitudes  $55^{\circ} 25'$  and  $54^{\circ} 55'$ . A number of the copper-zinc deposits, including the Sherritt-Gordon, have been discovered within the district and a main objective of the field work was to study these mineral deposits. The mineral deposits were found to be similar in general features to the well-known Flin Flon and other deposits to the south. They occur in highly altered sedimentary rocks believed to have a very wide distribution in northwestern Manitoba and adjacent parts of Saskatchewan. Consequently, the presence of valuable ore-bodies in these altered sediments is of great importance, for the large areas underlain by such rocks must now be considered worthy of careful study and search for additional deposits. The results obtained from the field work, in the form of a geological map and a report, are included in Summary Report 1928, Part B.

W. A. Johnston continued the investigation of the surface geology, including the soils, of an area in southern Manitoba and southeastern Saskatchewan, between latitudes 49 degrees and 52 degrees, and from longitude 102 degrees east to the Ontario boundary. The results are to be issued in the form of a geological map on a scale of 8 miles to 1 inch. Mapping of a large part of the area has been completed.

S. R. Kirk began a resurvey of the bedrock in southern Manitoba and southeastern Saskatchewan, between latitudes 49 degrees and 52 degrees, and from longitude 102 degrees east to the Ontario boundary, for the purpose of preparing a geological map on a scale of 8 miles to 1 inch. The work in 1928 was largely done in southwestern and western Manitoba. The study of the character and structure of the rocks in this part of Manitoba and adjacent parts of Saskatchewan is important in connexion with the occurrence of various non-metallic minerals of commercial value.

### Ontario

T. L. Tanton commenced a geological survey of Shebandowan Lake map-area, western Ontario. The area lies between latitudes  $48^{\circ} 30'$  and  $48^{\circ} 45'$  and longitudes  $90^{\circ}$  and  $90^{\circ} 30'$ , and includes about 400 square miles. Copper, nickel, and platinum sulphides, and other mineral deposits occur within the area. The area is also a critical one for the better understanding of the general geology of the region.

L. J. Weeks completed a geological survey of Michipicoten River map-area bounded by latitudes  $47^{\circ} 45'$  and  $48^{\circ}$ , and longitudes  $84^{\circ} 30'$  and  $85^{\circ}$ . The district is occupied by Precambrian lavas invaded by granite. Several gold-bearing properties are known, but a large part of the district is still unprospected.

W. H. Collins, assisted by Robert Thomson and W. A. Jones, continued systematic geographical and geological mapping of the Sudbury nickel basin and a complex area of Precambrian formations southwest of the nickel basin. A short report on certain phases of the work appears in Summary Report 1928, Part C. Since 1925 the Espanola quadrangle, between latitudes  $46^{\circ} 15'$ — $46^{\circ} 30'$  and longitudes  $81^{\circ} 30'$ — $82^{\circ} 00'$  has been mapped for publication of a map-sheet on a scale of 1 inch to 1 mile, and about half of the adjoining Sudbury West quadrangle, between latitudes  $46^{\circ} 15'$ — $46^{\circ} 30'$  and  $81^{\circ} 00'$ — $81^{\circ} 30'$  has been surveyed. The chief results of economic and scientific interest are: (1) considerable

changes have been made, as compared with existing maps, in the outer boundary of the nickel irruptive, along which boundary the deposits of nickel-copper sulphides occur, and further opportunities are indicated for prospecting, especially with electrical apparatus; (2) several faults have been located that intersect the nickel irruptive and may have some relation to the deposits of lead-zinc sulphides that occur inside the nickel basin; (3) the Sudbury series of sediments has been determined to be of pre-Huronian age and to overlie the Keewatin volcanics without evidence of unconformity or any important time interval. The Espanola map-sheet is in course of preparation for publication. Field work will be continued before the Sudbury West sheet and a report can be prepared.

Mr. Thomson concluded, from 1927, a study of the relations of the basic and acid edges of the nickel irruptive, as a subject for his doctorate thesis at University of Chicago.

Mr. Jones began, for his doctorate thesis at University of Toronto, a study of inclusions of sedimentary material in gabbro near Sudbury and of sedimentary materials in granite near Killarney that appear to afford exceptional evidence concerning the processes involved in the assimilation of solid rock matter by magmas. These studies are to be continued in 1929.

T. T. Quirke commenced a geological survey of an area just east of Parry Sound, bounded by latitudes  $40^{\circ} 15'$  and  $45^{\circ} 30'$  and longitudes  $79^{\circ} 30'$  and  $80^{\circ}$ . This is one of a series of map-units extending from the Huronian region near Killarney southeastward towards the Grenville region of eastern Ontario which Mr. Quirke has studied and mapped since 1923 in an endeavour to learn the relationship of these two geological subprovinces. The region mapped also contains a variety of useful non-metallic minerals, such as feldspar and quartzite, of possible commercial value because of their nearness to manufacturing centres along the Great Lakes.

H. M. Bannerman commenced systematic geographical and geological mapping of an area in Woman River district, lying between latitudes  $47^{\circ} 45'$  and  $48^{\circ}$ , and longitudes  $82^{\circ}$  and  $82^{\circ} 30'$ . The area is of particular interest because of the iron formation occurring within it. Lead-zinc deposits, some of them promising prospects, occur, and other known deposits hold small amounts of gold, silver, molybdenite, chromite, or asbestos. A short report on some features of interest is included in Summary Report 1928, Part C.

M. E. Wilson and G. M. Brownell continued geological mapping and the study of the mineral deposits of Westport map-area in eastern Ontario. The area is bounded by latitudes  $44^{\circ} 30'$  and  $44^{\circ} 45'$  and longitudes  $76^{\circ}$  and  $76^{\circ} 30'$ . The greater part of the mapping has been completed. Iron ore, lead ore, graphite, mica, siliceous sandstone, etc., occur in the district.

H. C. Cooke, in order that he might secure information necessary for the preparation of a report on the gold deposits of Canada, briefly studied the central Ontario, Kirkland Lake, and Porcupine gold fields in Ontario as well as the Nova Scotia gold field. In each field the general geological conditions, so far as they were related to the gold deposits, were studied, and the principal mining properties were investigated.

### Quebec

J. B. Mawdsley, with the assistance of H. D. Squires and S. H. Ross, geologically surveyed Desmeloizes map-area. This area of about 500 square miles is traversed by the Canadian National railway and adjoins the Quebec-Ontario boundary. Within this area of Keewatin greenstones invaded by various intrusives, are a number of mineral deposits, one of which is the important Abana zinc-copper deposit. An account of the mineral deposits is contained in Summary Report 1928, Part C.

Professor L. Gilchrist of the Department of Physics, Toronto University, and Mr. Mawdsley carried out investigations of electrical and electro-magnetic methods of prospecting. This work was done on the Abana property with the co-operation of three companies who engage in this class of work. The work has been undertaken in order to afford to the public an impartial account of this new, promising method of prospecting.

T. H. Clark continued mapping the geology and studying the mineral deposits of Sutton map-area, southern Quebec. The district has an area of 400 square miles and is bounded by latitudes  $45^{\circ}$  and  $45^{\circ} 15'$  and longitudes  $72^{\circ} 30'$  and  $73^{\circ}$ . This work, as well as that being carried out in the adjoining Lacolle map-area, is of fundamental importance in any attempt to appreciate the geological conditions pertaining to the mineralized belt in southeastern Quebec.

H. W. McGerrigle, under the direction of Mr. Clark, commenced a geological survey of Lacolle map-area lying between latitudes  $45^{\circ}$  and  $45^{\circ} 15'$  and longitudes  $73^{\circ}$  and  $73^{\circ} 30'$ . The objectives of this work are similar to those of the work in Sutton map-area; in addition there are, in Lacolle area, belts of limestone and marble affording materials much in demand.

S. A. Northrop, under the direction of F. J. Alcock, commenced a geographical and geological survey of an area bordering Chaleur bay between Port Daniel and Black cape. This work is part of a plan to map geologically the whole Chaleur Bay region.

#### *New Brunswick*

F. J. Alcock commenced the study and geological mapping of an area fronting on Chaleur bay, between Belledune river and Nash creek. Mr. Alcock also examined the following deposits, each of some economic interest: a clay deposit near St. John; a copper deposit on Starr island; a zinc occurrence at Frenchman creek; a gypsum deposit at Apohaqui; a copper prospect near Annidale; a copper prospect near Marrtown; the Lake George antimony deposit; and zinc-lead deposits on Bighole creek. An account of several of these deposits appears in Summary Report 1928, Part C.

#### *Nova Scotia*

E. R. Faribault, in view of the recent revival of interest in gold mining in Nova Scotia, re-examined the gold mines and prospects being operated. Special attention was given to deposits in Goldenville, Miller Lake, Beaver Dam, Tangier, Montague, and Oldham gold districts, and the operators were directly advised regarding their particular problems. During part of the season, the geological survey of Digby map-area was almost completed. This area is bounded by latitudes  $44^{\circ} 30'$  and  $45^{\circ}$ , and longitudes  $65^{\circ} 30'$  and  $66^{\circ}$ , and has an area of 460 square miles. The district includes the Clementsvale iron deposits which were worked many years ago. Mr. Faribault also examined a lead-zinc prospect recently reopened in Kemptville gold district.

I. W. Jones completed a geological survey of the west half of Springhill map-area, bounded by latitudes  $45^{\circ} 30'$  and  $45^{\circ} 45'$ , and longitudes  $64^{\circ} 15'$  and  $64^{\circ} 30'$ . Most of the area is underlain by Carboniferous strata and particular attention was paid to the distribution, correlation, and economic possibilities of the coal seams, some of which have been mined for very many years. Mr. Jones during part of the season was engaged in collecting samples of the Phalen seam, Sydney coal field. Thirteen pillars, each representing a complete section of the seam, were extracted and shipped to Ottawa for a complete physical and chemical examination, to be made jointly by the Mines Branch and Geological Survey.

G. W. H. Norman continued the geological mapping of Lake Ainslie map-area bounded by latitudes  $46^{\circ}$  and  $46^{\circ} 15'$  and longitudes  $61^{\circ}$  and  $61^{\circ} 30'$ . The district has an area of nearly 400 square miles in the central part of Inverness county and includes the coal-bearing areas of Port Hood, Mabou Mines, and Inverness, and the gypsum quarries at Mabou Harbour. Salt springs may indicate the presence of bedded salt deposits. Barite deposits on the east side of lake Ainslie have furnished a considerable tonnage of barite. The mineral resources and the geological conditions are such as to warrant a thorough study of the district.

## TOPOGRAPHICAL DIVISION

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

During the year topographical and geographical surveys were carried out in British Columbia, Alberta, Manitoba, Ontario, Quebec, New Brunswick, and Nova Scotia.

### *British Columbia*

A. C. T. Sheppard, assisted by A. C. Tuttle, carried out detailed topographical mapping of the Corbin coal area. An area of about 5 square miles was mapped on a scale of 1 inch to 800 feet with contour interval 25 feet. Mr. Sheppard also visited, for the purpose of inspecting and advising on any matters relating to the field work, the parties working under R. Bartlett and S. M. Steeves.

R. Bartlett mapped topographically an area of about 80 square miles in the vicinity of Alice Arm. This area is part of two 15 by 30 minute quadrangles between latitudes  $55^{\circ} 30'$ - $55^{\circ} 45'$  and longitudes  $129^{\circ}$ - $130^{\circ}$ , in which work will be continued next year and map-sheets will be published on a scale of one inch to one mile, partly with contour interval of 100 feet.

S. M. Steeves completed 165 square miles of the topographical mapping of the Salmo quadrangle, latitude  $49^{\circ} 00'$  to  $49^{\circ} 15'$ , longitude  $117^{\circ} 00'$  and  $117^{\circ} 30'$ . This map is for publication at one inch to one mile with contour interval 100 feet. Work will be continued in 1929.

### *Alberta*

S. C. McLean carried out primary triangulation control for map-sheets west of Calgary. Approximately 500 square miles were controlled.

D. A. Nichols mapped topographically about 100 square miles of the west half of the Jumpingpound quadrangle, latitude  $51^{\circ} 00'$  to  $51^{\circ} 15'$ , longitude  $114^{\circ} 30'$  to  $115^{\circ} 00'$ . He also commenced topographical mapping of the Wilkcat Hills quadrangle, latitude  $51^{\circ} 15'$  to  $51^{\circ} 30'$ , longitude  $114^{\circ} 30'$  to  $115^{\circ} 00'$ . Both sheets are for publication at one inch to one mile with contour interval 25 feet.

W. H. Miller carried out the detailed topographical mapping, on a scale of 1 inch to 1,000 feet with contour interval 25 feet, of the Thoreau Creek coal area. This work covered approximately 12 square miles. Mr. Miller also commenced topographical mapping of the quadrangle contained between latitudes  $53^{\circ} 30'$  to  $53^{\circ} 45'$ , and longitudes  $118^{\circ} 30'$  to  $118^{\circ} 45'$ . This sheet is for publication at one inch to one mile with contour interval 100 feet. Approximately 40 square miles of this latter area was mapped during the season.

### *Manitoba*

R. C. McDonald carried out the transit and tape and transit and stadia control surveys for the Flin Flon sheet, latitude  $54^{\circ} 45'$  to  $55^{\circ} 00'$ , longitude  $101^{\circ} 30'$  to  $102^{\circ} 00'$ . The details of this map will be filled in from vertical aerial

photography. The map will cover an area of approximately 355 square miles and will be published at a scale of one inch to one mile. Mr. McDonald also carried out the transit and tape and transit and stadia control surveys for a mineralized area of about 50 square miles east of lake Winnipeg, which includes Long lake and Beresford lake. The map is on a scale of 1 inch to 1,000 feet. Details will be filled in from vertical aerial photography.

### Ontario

Control for the Parry Sound sheet, latitude  $45^{\circ} 15'$  to  $45^{\circ} 30'$ , longitude  $80^{\circ} 00'$  to  $80^{\circ} 30'$ , was carried out by S. C. McLean, H. N. Spence, and K. G. Chipman, working independently. S. C. McLean ran primary control traverses; K. G. Chipman carried a secondary triangulation along the shore of Georgian bay; and H. N. Spence ran transit and tape or transit and stadia control surveys along roads and shorelines over selected routes. This work is required for one inch to one mile mapping from vertical aerial photography.

A. G. Haultain continued the control surveys in the Copper Cliff quadrangle, latitude  $46^{\circ} 15'$  to  $46^{\circ} 30'$ , longitude  $81^{\circ} 00'$  to  $81^{\circ} 30'$ , and the Chelmsford quadrangle, latitude  $46^{\circ} 30'$  to  $46^{\circ} 45'$ , longitude  $81^{\circ} 00'$  to  $81^{\circ} 30'$ . Details in these areas will be filled in from vertical aerial photography and sheets published on a scale of one inch to one mile.

H. N. Spence carried out the geographical control for the Michipicoten River sheet, latitude  $47^{\circ} 45'$  to  $48^{\circ} 00'$  north, longitude  $84^{\circ} 30'$  to  $85^{\circ} 00'$ . This work is for a geographical sheet on the scale of one inch to one mile.

### Quebec

J. V. Butterworth carried out transit and tape control surveys for the Desmeloizes sheet, latitude  $48^{\circ} 45'$  to  $49^{\circ} 00'$ , longitude  $79^{\circ} 00'$  to the Quebec-Ontario boundary. A geographical control survey was also made of the portion of lake Abitibi east of the Interprovincial Boundary.

### New Brunswick

J. W. Spence mapped topographically the Hillsborough quadrangle, latitude  $45^{\circ} 45'$  to  $46^{\circ} 00'$ , longitude  $64^{\circ} 30'$  to  $65^{\circ} 00'$ . The map of this area, which embraces more than 400 square miles, will be published on a scale of one inch to one mile with a contour interval of 50 feet.

S. C. McLean carried out transit and tape control surveys for the east half of the St. John East sheet, latitude  $45^{\circ} 15'$  to  $45^{\circ} 30'$ , longitude  $65^{\circ} 30'$  to  $66^{\circ} 00'$ . Details of drainage will be put in from vertical aerial photography.

### Nova Scotia

J. A. Macdonald carried out transit and tape control surveys in the Port Mouton quadrangle, latitude  $43^{\circ} 45'$  to  $44^{\circ} 00'$ , longitude  $64^{\circ} 30'$  to  $65^{\circ} 00'$ , and part of the Liverpool sheet, latitude  $44^{\circ} 00'$  to  $44^{\circ} 15'$ , longitude  $64^{\circ} 30'$  to  $65^{\circ} 00'$ . In Cape Breton he completed the transit and tape and plane table surveys for the Lake Ainslie sheet, latitude  $46^{\circ} 00'$  to  $46^{\circ} 15'$ , longitude  $61^{\circ} 00'$  to  $61^{\circ} 30'$ . In these areas details will be filled in from vertical aerial photography.

K. G. Chipman visited, for the purpose of inspecting and advising on any matters relating to the field work, the parties working under J. W. Spence and J. A. Macdonald.

The following maps were completed during the year:

Province	Map-sheet	Latitude and longitude	Scale
British Columbia.....	Corbin detail.....	50° 30' - 50° 45'	1 inch to 1,000 feet
Alberta.....	Turner valley.....	114° 00' - 114° 30'	1 inch to $\frac{1}{2}$ mile
Alberta.....	Thoreau Creek detail.....		1 inch to 1,000 feet

The nucleus of a geographical section for the National Museum is being assembled by Mr. D. A. Nichols, incidentally to his duties of Topographical Engineer, with the assistance of the relief map-maker. So far, the exhibit consists only of relief map models to illustrate topographical and geological features, and photographs; but it is proposed as time and facilities permit, to include exhibits representing relations of Canadian geography to transportation, industries, habitation, etc.

### MINERALOGICAL DIVISION

Eugene Poitevin, Chief of the Division, reports:

The staff of the division was taxed to capacity during the past fiscal year, due largely to the steadily increasing interest shown by the public in the mining industry of Canada. A great number of mineral specimens received were examined and the demand for mineral collections for educational purposes was large.

Many years ago it was the duty of this division to collect minerals from the principal mining camps throughout Canada for the purpose of preparing special economic collections which were displayed in Canada or abroad. Since 1920 this work has been carried on by the Exhibition Branch of the Department of Trade and Commerce, but this year the Division of Mineralogy was again called upon to make exhibits in Toronto, Minneapolis, and Regina, and it seems likely that more will be prepared in the near future.

#### FIELD WORK

Eugene Poitevin visited the Cobalt mines for a few days to collect specimens for the Museum and spent the remainder of the time (three weeks) in the serpentine belt of the Eastern Townships of Quebec gathering additional information about the mineralogy of this important area.

H. V. Ellsworth spent two weeks studying rare mineral occurrences in the central Ontario area, one week examining the granites of the Brockville-Mallorytown area, and a few days in company with Eugene Poitevin in the Arundel area, Quebec.

A. T. McKinnon spent two months in Ontario and Quebec collecting minerals required for the preparation of educational collections and also collecting valuable mineral specimens for the Museum from various localities.

#### LABORATORY WORK

The amount of work performed in the laboratory was unusually large. More than 2,500 rocks and mineral specimens and other samples of various natures were examined and reported on in detail. These specimens came from geologists, mining engineers, prospectors, educational institutions, and others



interested in the mining industry, and were from all parts of Canada. In addition, about 1,500 verbal reports were given to persons who called at the office.

Eugene Poitevin has been working on the optical properties of numerous minerals from the Silver Leaf mine, Manitoba, some minerals from the Quebec serpentine belt, and one new mineral from British Columbia.

H. V. Ellsworth has completed the writing of an economic geology series report on the occurrences of rare earth minerals of Canada. He did a large amount of chemical work on minerals dealt with in this report.

R. J. C. Fabry, analyst, has performed a number of complicated analyses of the topaz, beryl, and margarodite type from the Silver Leaf mine. He has also undertaken the study of perovskite and ilmenite from the serpentines of lake Nicolet in the Eastern Townships of Quebec. He has made analyses of natrolite and prehnite from the granite dykes occurring in the peridotite of Thetford mines. He completed the analyses of a sillimanite gneiss and a charnockite from Kandy, Ceylon, for Dr. F. D. Adams, and also the analyses of a limestone from Ainslie lake, N.S., and three rocks submitted by Dr. T. T. Quirke from Parry Sound district, Ontario. Mr. Fabry also did some research work for Mr. Taverner, ornithologist of the Museum, to determine whether certain colorations found in bird feathers were due to secretions from the bird or due to external environment.

#### MUSEUM WORK

Owing to the amount of field and laboratory work, the museum work has not been so extensive as it would otherwise have been. Some twenty cases in the National Museum were filled and plans for further exhibits proposed. More than 3,000 mineral specimens were added to the systematic and the economic collections.

#### EDUCATIONAL COLLECTIONS

The division was equally as busy in preparing educational collections. The extent of the work carried on is shown by the following table, which shows that 379 collections were shipped to various institutions. Of these, each Standard collection contains 144 specimens, Grade 2 contains 44 specimens, Grade 3 contains 40 specimens, Grade 4, a special collection prepared for the Department of Mines, Quebec, contains 40 specimens, Prospectors' collection contains 16 specimens, miscellaneous or special collections vary from a few to more than 100 specimens. Mineral chips collection contains 46 bags of minerals—thus making 11,835 specimens, representing 27,400 pounds of mineral specimens, distributed.

Province	Grade 1	Grade 2	Grade 3	Grade 4	Prospectors'	Miscellaneous	Mineral chips	Kegs
British Columbia.....	3	1	1	0	5	0	0	0
Alberta.....	0	1	0	0	0	2	1	0
Saskatchewan.....	1	0	1	0	3	0	0	0
Manitoba.....	2	1	1	0	66	1	1	1
Ontario.....	4	6	48	0	58	22	2	0
Quebec.....	7	1	0	75	27	13	0	0
New Brunswick.....	0	0	0	0	4	1	1	0
Nova Scotia.....	1	0	0	0	0	2	0	0
Foreign.....	1	0	1	0	3	9	0	1
	19	10	52	75	166	50	5	2

## PALÆONTOLOGICAL DIVISION

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

## FIELD WORK

✓ W. A. Bell was engaged in the field from June to August inclusive, partly in correlating formations in Lake Ainslie district, which were being mapped by Mr. G. W. H. Norman, and partly in correlating drill cores cut by coal operators in Pictou coal field. During October he examined stratigraphic relations of the salt bed that had been located by drilling at Gautreau, near Moncton, New Brunswick.

✓ E. M. Kindle was occupied with correlation problems and directing geological mapping in Gaspé peninsula. Field work was carried on from July to September in the coastal belt along the north side of Chaleur bay. Mapping of this belt between Port Daniel bay and Malbaie by Cecil Kindle was begun in June under the supervision of F. J. Alcock and continued under the direction of E. M. Kindle until the end of the season.

✓ F. H. McLearn spent the season in studying the stratigraphy and structure of a part of southern Saskatchewan, a continuation of the work begun in the summer of 1927 (*See also* under Geological Division, page 9).

✓ C. M. Sternberg spent the first two weeks of the field season examining the strata, which were being studied by F. H. McLearn, in southern Saskatchewan, for vertebrate fossils. The rest of the field season was devoted to the Belly River formation near Steeville, Alberta, where he collected dinosaurian and other vertebrate remains.

Miss A. E. Wilson spent about two months in field work in the Cornwall quadrangle, Ontario, making a geological map of the outcrops. A section across the area mapped includes sediments from the Aylmer limestone of the Chazy formation to the Cobourg beds at the top of the Trenton.

## OFFICE WORK

Office work by W. A. Bell comprised, in addition to work toward publication of map and reports on Pictou coal field, study of and reports on collections of fossil plants from the following districts: Brûlé coal field, Alberta, White Lake district, B.C., Taseko river, B.C., Pincher creek, Alberta, southern Saskatchewan, and Joggins-Springhill.

E. M. Kindle has prepared several reports on collections of fossils for members of the Geological Survey, for oil companies, and others. A manuscript on one of the formations studied in Gaspé peninsula has been written and a short paper on a Pleistocene Crustacean new to North America has been published.

F. H. McLearn has devoted most of the office season to the examination of collections submitted by field officers for determination, and to preparation of map, sections, etc., and to a summary report on part of southern Saskatchewan studied in the field season of 1928. In addition, papers on the stratigraphy and Cretaceous invertebrates of Blairmore map-area were given a final revision and were assembled with other palæontological and palæobotanical papers for a museum bulletin on the stratigraphy and palæontology of Blairmore area. In time available the study of the ammonoids of the Upper Triassic Schooler Creek formation and the Jurassic ammonoids of the Maude and Yukon formations was continued.

C. M. Sternberg studied vertebrate fossils collected by members of the staff and continued preparation of vertebrate collections.

Miss M. A. Fritz, of the Department of Geology, University of Toronto, was again engaged for three months during the summer in working over old collections of fossils that have been in storage and preparing this material for addition to the reference collection.

#### ACCESSIONS

Collections of fossils have been received from members of the staff as follows: W. G. H. Norman, F. H. McLearn, I. W. Jones, E. R. Faribault, G. S. Hume, F. J. Alcock, B. R. MacKay, H. S. Bostock, E. M. Kindle, A. E. Wilson, M. E. Wilson.

#### BORINGS DIVISION

D.C. Maddox, Acting Chief of the Division, reports:

During the year the work of collecting samples and records from wells drilled for oil, gas, and water from all parts of the Dominion was continued, as was also the examination of samples and the recording of the results of such examination, storage of samples, and filing of records. Co-operation with the drillers of water wells was established in many cases and much valuable information regarding the formations passed through and occurrences of water in the wells drilled was thereby obtained. It is hoped that this co-operation will be extended in the future by the establishment of improved methods for aiding the driller in his work.

Assistance has been received from the following:

The Department of the Interior, through Mr. C. C. Ross, Supervisory Mining Engineer, who has charge of the collection of samples and records from wells drilled for oil and gas on Dominion lands in the Prairie Provinces and the railway belt of British Columbia and provides samples and information about wells drilled. In return, the Borings Division supplies the results of sample examination and the results of the palæontological examination of fossils found in samples taken from oil and gas wells.

The Ontario Department of Mines, which, through the courtesy of Col. R. B. Harkness, provided the division with the logs of all wells drilled during the previous two years, together with information as to water occurrences in those wells.

Other government organizations, among them the Department of Agriculture, the Forestry Branch, and the Water Power and Reclamation Service, assisted the division by providing lists of drillers or by notifying the division that wells were being sunk. Geological information in certain areas, with special reference to water conditions, was supplied to several of these departments on request.

The departments of Public Health of several of the provinces provided the division with information as to the chemical nature of the municipal water supply of the principal cities and towns in the provinces. The waterworks engineers of some of the larger cities also co-operated in this work. The Canadian National and Canadian Pacific railways supplied a good deal of information as to wells drilled at stations on branch lines in the western provinces, most of this information coming through Messrs. Duff, Flint, and Company, of Regina, drilling contractors, to whom thanks are due for the collection of these data. Detailed information as to samples and records received will be found in the Summary Reports for the year, these being divided territorially under:

Part A, British Columbia and Yukon;

Part B, Prairie Provinces;

Part C, Ontario, Quebec, and the Maritime Provinces.

A brief review of some of the principal features in the provinces follows.

*British Columbia.* Drilling for oil and gas was largely confined to the Sage Creek district in Flathead valley. Two wells were drilled during the year from one of which, the B.C. Oil and Gas Company's well, 58 samples were received, examined, and bottled.

*Prairie Provinces.* The amount of drilling for oil and gas in these provinces greatly increased during the year. In Turner valley the development was remarkable, this field providing a large proportion of the oil and gas produced from the western provinces. Sixty-three and a half per cent of all samples received during the year came from this field, the total received, 11,122, representing about 21 miles of drilling.

The success which attended the search for oil and gas in Turner valley has greatly stimulated interest in other western Canadian fields. Several private companies have done much geological work and structures are being tested in all parts of the west from township 89 to the International border. The Wainwright, Ribstone, Milk River, and Pincher Creek fields send in large numbers of samples, but many others also contribute. Five thousand four hundred and thirty-six samples, representing about 10.3 miles of drilling, were received from western oil and gas wells other than Turner valley. The division was of assistance to some operators in forwarding samples taken from wells drilled some time back in areas in which renewed interest is now being taken. One thousand seven hundred and forty-four samples were sent out.

*Ontario.* Drilling for oil and gas is under the control of Col. R. B. Harkness, the Gas Commissioner. Records covering 249 wells were received. An attempt to obtain the co-operation of drillers in the matter of drilling for water resulted in the receipt of 125 records and 328 samples.

The only well drilled for oil and gas from which samples were examined was one put down near Collingwood. As a result of this examination a bed of bentonite was located in the Ordovician Trenton limestone at this point.

*New Brunswick.* Drilling for oil and gas was confined to the operation of the New Brunswick Gas and Oilfields Limited in Stony Creek area near Moncton. Dr. J. A. L. Henderson continued to co-operate with the division by forwarding logs of wells drilled. Samples from well No. 85 of this company in Gautreau district were received and examined.

*Nova Scotia.* Drilling for oil and gas seems to have been confined to tests for structure. The logs of six test holes of this nature put down in Minudie district by the Imperial Oil Company were forwarded through the courtesy of Mr. John Ness.

No further tests for oil and gas were made in Prince Edward Island since the abandonment of the two deep holes made by the Doherty interests in this province. All records received were from wells drilled for water.

The list of samples and records follows:

	Records	Samples
British Columbia.....	4	62
Prairie Provinces, oil and gas.....	101	16,558
"          "          water.....	58	148
Ontario, oil and gas.....	249	43
"          "          water.....	125	328
Quebec.....	5	94
New Brunswick.....	20	230
Nova Scotia.....	13	114
Prince Edward Island.....	9	12
Total.....	584	17,587

In addition to the routine work done on well samples, considerable attention was devoted to the study of the heavy mineral content of some of the material and about 300 permanent slides of these minerals were made. Mr. F. J. Fraser continued from 1927 the mechanical analysis and the isolation and identification of the heavy minerals in sediments collected in southern Saskatchewan by F. H. McLearn. About 400 slides were prepared and drawings made of 42 of the grains which were photographed and distributed to other workers in this field of research. Interchange of information was made with several British workers, including Dr. W. F. Fleet, Prof. P. G. H. Boswell, of Liverpool University, and Dr. Frank Raw, of Birmingham University; and with several Canadian workers, among these Prof. R. C. Wallace and Messrs. I. G. Spratt, and G. C. McCartney.

Field work was done by R. T. D. Wickenden in connexion with the study of foraminifera from the western Cretaceous sediments. This involved the collection of surface samples at points ranging from Blairmore to the Manitoba escarpment and several wells were visited. The work was in continuation of that done in 1927 and in which Dr. J. A. Cushman is co-operating. D. C. Maddox made a short trip to L'Assomption district in connexion with possible deep water supplies in that area.

### DRAUGHTING AND REPRODUCING DIVISION

C.-Omer Sénécal, Geographer, and A. Dickison, Chief, Draughting and Reproducing Division, jointly report:

#### Maps Published April 1, 1928, to March 31, 1929

Series A	Publication number	Title	Remarks
<b>NORTHWEST TERRITORIES</b>			
219A	2170	Head of Cumberland sound and route to Nettilling lake, Baffin island; scale 1 inch to 8 miles.....	Geology. For report by L. J. Weeks, Summary Report, part C, 1927
<b>YUKON</b>			
205A	2152	Dezadeash Lake area; scale 1 inch to 4 miles.....	Geology. For report by W. E. Cockfield, Summary Report, part A, 1927
227A	2185	Little Salmon area; scale 1 inch to 4 miles.....	Geology. For report by W. E. Cockfield, Summary Report, part A, 1928
<b>BRITISH COLUMBIA</b>			
193A	2130	Stewart sheet (west half), Cassiar district; scale, 1 inch to 1 mile.....	Topography
196A	2138	Vancouver sheet; scale, 1 inch to 8 miles.....	Geology
200A	2144	Slocan sheet, Kootenay district; scale, 1 inch to 1 mile.....	Topography
207A	2156	Finlay River area, Cassiar district; scale 1 inch to 8 miles.....	Geology. For report by V. Dolmage, Summary Report, part A, 1927
<b>ALBERTA</b>			
201A	2145	Mountain Park sheet (west of fifth meridian); scale, 1 inch to 1 mile.....	Topography
202A	2146	Cadomin sheet (west of fifth meridian); scale, 1 inch to 1 mile.....	Topography
204A	2150	Calgary sheet; scale, 1 inch to 8 miles.....	Geology
—	2151	Sections supplementing Map 204A, Calgary sheet..	Geology

## Maps Published April 1, 1928, to March 31, 1929—Continued

Series A	Publication number	Title	Remarks
SASKATCHEWAN			
212A	2161	Cypress Hills area, scale 1 inch to 1 mile.....	Geology. For report by F. H. McLearn, Summary Report, part B, 1927
MANITOBA AND SASKATCHEWAN			
—	1726	Athapapuskow Lake region; scale, 1 inch to 3 miles	Geology. Reprint
MANITOBA			
—	1801	Reed and Wekusko Lakes region; scale, 1 inch to 2 miles.....	Geology. Reprint
195A	2137	Beresford and Rice Lakes area (east of Principal meridian); scale, 1 inch to 1 mile.....	Geology. For memoir by J. F. Wright
211A	2160	Island Lake area; scale, 1 inch to 2 miles.....	Geology. For report by J. F. Wright, Summary Report, part B, 1927
ONTARIO			
198A	2141	Fort William and Port Arthur sheet, Thunder Bay district; scale, 1 inch to 1 mile.....	Geology (bedrock geology). For Memoir by T. L. Tanton
203A	2149	Thunder Cape sheet, Thunder Bay district; scale, 1 inch to 1 mile.....	Geology. For memoir by T. L. Tanton
213A	2164	Kakabeka sheet (provisional), Thunder Bay district; scale, 1 inch to 1 mile.....	Geology. For memoir by T. L. Tanton
214A	2165	Loon sheet (provisional), Thunder Bay district; scale, 1 inch to 1 mile.....	Geology. For memoir by T. L. Tanton
230A	2189	Ridout sheet (provisional), Sudbury district; scale, 1 inch to 1 mile.....	Geology. For memoir by R. C. Emmons and E. Thomson
231A	2190	Woman River sheet (provisional), Sudbury district; scale, 1 inch to 1 mile.....	Geology. For memoir by R. C. Emmons and E. Thomson
QUEBEC			
206A	2155	Piedmont sheet, Abitibi county; scale, 1 inch to 1 mile.....	Geology
210A	2129	Part of Lemieux township, Gaspé county; scale, 1 inch to $\frac{1}{4}$ mile.....	Geology. For report by F. J. Alcock, Summary Report, part C, 1927
222A	2175	Lake David area, Abitibi territory; scale, 1 inch to 1 mile.....	Geology. For report by J. B. Mawdsley, Summary Report, part C, 1927
NOVA SCOTIA			
223A	2177	North Mountain area, Inverness county; scale, 1 inch to 1 mile.....	Geology. For report by T. D. Guernsey, Summary Report, part C, 1927

## Maps in Hands of King's Printer, March 31, 1929

Series A	Publication number	Title	Remarks
<b>BRITISH COLUMBIA</b>			
199A	2143	Britannia Beach sheet, New Westminster district; scale, 1 inch to 1 mile.....	Geology. For memoir by H. T. James
—	2180	Ore deposits of the Britannia shear zone, New Westminster district; scale, 1 inch to 200 feet.....	Geology. For memoir by H. T. James
215A	2166	Stewart sheet (west half), Cassiar district; scale, 1 inch to 1 mile.....	Geology. For memoir by G. Hanson
216A	2167	Bear River sheet (west half), Cassiar district; scale, 1 inch to 1 mile.....	Geology. For memoir by G. Hanson
217A	2168	Bear River sheet (west half), Cassiar district; scale, 1 inch to 1 mile.....	Topography
232A	2192	Portion of Slocan and Upper Arrow Lakes area, Kootenay district; scale, 1 inch to 2 miles.....	Geology. For report by C. E. Cairnes, Summary Report, part A, 1928
<b>ALBERTA</b>			
208A	2157	Mountain Park sheet (west of fifth meridian); scale, 1 inch to 1 mile.....	Geology. For memoir by B. R. MacKay
209A	2158	Cadomin sheet (west of fifth meridian); scale, 1 inch to 1 mile.....	Geology. For memoir by B. R. MacKay
225A	2133	Brûlé Mines area; scale, 1 inch to 1,000 feet.....	Geology. For report by B. R. MacKay, Summary Report, part B, 1923
<b>ONTARIO</b>			
155A	1553	Lake Huron sheet; scale, 1 inch to 8 miles.....	Geology. Second edition
197A	1939	Fort William and Port Arthur sheet, Thunder Bay district; scale, 1 inch to 1 mile.....	Geology (surface deposits). For memoir by T. L. Tanton
<b>NOVA SCOTIA</b>			
—	2153	Mahone Bay sheet, No. 88, Lunenburg county; scale, 1 inch to 1 mile.....	Geology
—	2154	Bridgewater sheet, No. 89, Lunenburg county; scale, 1 inch to 1 mile.....	Geology

## Other Map-Work in Varying Stages of Progress

	Title	Remarks
<b>YUKON AND BRITISH COLUMBIA</b>		
1	Atlin sheet; scale, 1 inch to 8 miles.....	Geology
<b>BRITISH COLUMBIA</b>		
1	Kootenay Lake area, Kootenay district; scale, 1 inch to 4 miles.....	Geology. For report by J. F. Walker, Summary Report, part A, 1928
2	Big Bend area, Columbia river; scale, 1 inch to 4 miles.....	Geology. For report by H. C. Gunning, Summary Report, part A, 1928
3	Lardeau area, Kootenay district; scale, 1 inch to 4 miles.....	Geology. For memoir by M. F. Bancroft, J. F. Walker, and H. C. Gunning
4	Topley sheet, Coast district; scale, 1 inch to 1 mile.....	Geology
5	Copper Mountain mining area, Similkameen district; scale, 1 inch to 1,000 feet.....	Geology. For memoir by V. Dolmage

## Other Map-Work in Varying Stages of Progress—Continued

—	Title	Remarks
<b>ALBERTA</b>		
1	Lovett sheet (west of fifth meridian); scale, 1 inch to 1 mile.....	Topography
2	Cardinal River sheet (west of fifth meridian); scale, 1 inch to 1 mile.....	Topography
3	Turner Valley sheet (west of fifth meridian); scale, 1 inch to 1 mile.....	Topography
4	Cadomin-Luscar coal basin; scale, 1 inch to 2,000 feet.....	Geology. For memoir by B. R. MacKay
<b>SASKATCHEWAN AND MANITOBA</b>		
1	Reindeer Lake area; scale, 1 inch to 6 miles.....	Geology. For report by C. H. Stockwell, Summary Report, part B, 1928
<b>MANITOBA</b>		
1	Kississing Lake area; scale, 1 inch to 2 miles.....	Geology. For report by J. F. Wright, Summary Report, part B, 1928
2	Winnipeg sheet; scale, 1 inch to 8 miles.....	Geology (surface deposits)
<b>ONTARIO</b>		
1	Panache sheet, Sudbury and Manitoulin districts; scale, 1 inch to 1 mile.....	Geology. For memoir by T. T. Quirke and W. H. Collins
2	Collins Inlet sheet, Manitoulin and Sudbury districts; scale, 1 inch to 1 mile.....	Geology. For memoir by T. T. Quirke and W. H. Collins
3	Delamere sheet, Sudbury and Parry Sound districts; scale, 1 inch to 1 mile.....	Geology. For memoir by T. T. Quirke
4	Key Harbour sheet, Parry Sound and Sudbury districts; scale, 1 inch to 1 mile.....	Geology. For memoir by T. T. Quirke
5	Shebandowan sheet, Thunder Bay district; scale, 1 inch to 1 mile.....	Geology
<b>QUEBEC</b>		
1	Dubuisson sheet, Abitibi county; scale, 1 inch to 1 mile.....	Geology
2	Opazatika sheet, Témiscamingue county; scale, 1 inch to 1 mile.....	Geology
3	Carleton sheet, Bonaventure county; scale, 1 inch to 1 mile.....	Topography
<b>NEW BRUNSWICK</b>		
1	New Brunswick sheet; scale, 1 inch to 8 miles.....	Geology
<b>NOVA SCOTIA</b>		
1	Digby sheet, Digby and Annapolis counties; scale, 1 inch to 1 mile.....	Topography
2	New Ross sheet, No. 86, Lunenburg and Hants counties; scale, 1 inch to 1 mile.....	Geology

In addition to the foregoing, fifty-seven map and related figure drawings were prepared for reproduction by zinc-cut process, for the illustrating of reports, memoirs, and bulletins; other draughting and associated work necessary for staff and public use amounted to one hundred items.

The duties of the Geographer in connexion with the Geographic Board of Canada have, as usual, been attended to. A Museum Bulletin entitled "Transverse Polyconic Projection for General Maps of Canada," by C. O. Senécal, has been published.



## PHOTOGRAPHIC DIVISION

George G. Clarke, Chief of the Division, reports the following work accomplished during the year. A steadily increasing share of this output during recent years has been for other branches of the Department and for the public, to whom photographs for lectures, published articles, and other purposes are supplied at cost.

	Inches	Inches	Number
Contact prints.....	4 x 5	to 36 x 48	13,302
Bromide enlargements.....	4 x 5	to 40 x 72	953
Exposures developed.....	3½ x 4½	to 6½ x 8½	5,361
Dry plate negatives.....	4 x 5	to 11 x 14	465
Wet plate negatives.....	8 x 10	to 24 x 30	179
Zinc plates.....	11 x 14	to 24 x 36	20
Photostat copies.....	7 x 11	to 11 x 14	255
Lantern slides.....		3½ x 4	643
Photos and maps mounted.....			6,404
Total.....			<u>27,582</u>

The collection of negatives has now grown to more than seventy thousand and comprises photographs of a great variety of subjects from all parts of Canada that have been taken by officers of the Survey during the past sixty or seventy years. It has grown to be of much scientific and even of historical value. However, as no systematic method of selection was instituted at the beginning, the collection includes a rather large proportion of duplicates, and negatives of little subjective value or imperfect photographic quality. These defects are now being corrected. Under the supervision of Mr. W. A. Johnston, the entire collection is being inspected and all negatives of little or no value discarded. It is expected that a reduction of over one-half will be made. Also, to prevent recurrence of this fault, provision has been made to have only selected negatives added to the collection henceforth.

In order to make the renovated collection more readily available to members of the staff, to other Government departments, and to the public, a collection of prints from these negatives is being assembled in the Library. This collection is complete from the year 1916 and within two years should be complete to that time.

## 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 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. 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 40,854 publications, exclusive of the French editions, were distributed. Of these, 6,366 were sent to addresses on the regular mailing lists, and 34,488 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 year include:

Books purchased.....	652
Volumes received as gifts or exchanges.....	996
Pamphlets.....	446
Maps.....	235
Periodicals subscribed for.....	208
Periodicals received as exchanges.....	459

Six hundred and seventy books were bound, and over 200 publications were placed in pamphlet or folio binders. The bindings of 91 valuable old volumes were repaired.

Owing to changes in the personnel of the library staff the amount of cataloguing accomplished during the year was somewhat less than usual, 2,987 cards being added to the catalogue. Certain important series were analysed under author and subject, analytical cards for 321 volumes being inserted in the catalogue. Accessions not reported above amount to 428 volumes. One hundred and four pamphlets were catalogued and approximately 300 reprints filed.

The lantern slide collection was increased by slides formerly kept in the Biological Division. The bird slides, especially, are extremely popular, and frequent requests are made for their loan to schools and societies. A large number of slides illustrating Canadian geology, mining, physiography, transportation, etc., have been loaned during the year.

Correspondence and reference work and the compiling of bibliographies has been continued.

The recorded loans were 5,153 books, in addition to those used by the many readers who consult the library in person. Inter-library loans were made to eight Canadian universities, to three in the United States, to nineteen Government departments in Ottawa, and to Government laboratories throughout the Dominion.

The Library has again been fortunate in the acquisition of several rare and valuable works, among which may be mentioned: *Linnaean Society Transactions, Zoology*, series 2, vols. 1-19, 1875-1926; *Botany*, series 2, vols. 1-8, 1875-1915; Zahlbruckner's *Catalogus Lichenum Universalis*, 1825-1828; Linnaeus' *Systema Vegetabilium* editio 9, 1817-1820; Ledebour's *Flora Altaica*, 4 vols., 1829-32; Schioler's *Birds of Denmark*, vols. 1-2, 1925-26; Richtofen's *China*, vols. 3 and 5 with Atlas volume 2 (completing the work). The *Nassauischer Verein für Naturkunde in Wiesbaden* presented to the library volumes 23-45, 1869-1892 of their *Jahrbuch*, providing for us an unbroken series from vol. 21 to date; from the *Geologische Anstalt of Prussia* was received the *Beitrag zur geologischen Erforschung der Deutschen Schutzgebiete*, Nos. 1-15, 17-19, 1913-1923. Among the notable series procured during the year were *Nova Acta*, vols. 9-13 and 16, 1874-1893 of the *Royal Society of Upsala*; *Heg's Illustrierte Flora von Mittel Europa*, 11 volumes, the first three being the gift of M. O. Malte, Chief Botanist; and a complete set of the *Journal of Morphology*, presented by the Librarian of Parliament.

BRITISH COLUMBIA OFFICE

Victor Dolmage, Geologist in charge, reports:

Owing to the greatly increased interest in mining in British Columbia, not only by the mining companies but by the general public, the activities of the British Columbia Office have grown considerably. During the year 4,300 visitors registered at the office, 584 inquiries were answered by letter and an unusually large number by telephone; 2,400 reports and 2,650 maps were distributed, and a large number of rock specimens and minerals were examined and reported on. Geological investigations were made of the Bridge River-Seton Lake tunnel site for the British Columbia Electric Railway Company; of the Ruskin dam site for the same company; and of the Capilano and Seymour canyons for the Greater Vancouver Water and Sewerage Board. This work was done in addition to the usual field work. Twenty-six lectures on geological and mining subjects were given during the year.

The staff is composed of V. Dolmage and F. A. Kerr, geologists, and A. J. C. Nettell, Assistant Engineer.

## NATIONAL MUSEUM OF CANADA

*W. H. Collins, Acting Director*

The National Museum of Canada is dependent on the Geological Survey for the preparation of its exhibits of mineralogical, palæontological, and geological specimens, and an outline of this work is given in the report of that branch. The heads of the Anthropological and Biological Divisions describe in their reports, given below, the activities of their respective staffs.

In previous reports strong emphasis has been laid on the need of more commodious quarters for exhibition halls, of laboratories, preparators' workshops, and safe and ample storage. Each year the need becomes more acute and is now most keenly felt.

A great mass of material worthy of display in the National Museum has been accumulated and much of it has to remain in storage. Moreover, the interest of other government departments in museum work has been aroused and active co-operation could be secured if facilities for exhibition were available. The Forestry Branch of the Department of the Interior has nearly completed exhibits of forest products for three cases and the Dominion Entomologist will make use of one case at an early date. These exhibits are illustrative of what might be developed into an extensive series.

A series of lectures, of a semi-popular character, on scientific subjects, is given throughout the winter months in the lecture hall of the Museum. Each lecture is given on Saturday morning to children and on the following Wednesday evening to adults. The total attendance of children at these lectures during the winter of 1928-29 was 7,950 and of adults 1,978. The lecture committee, H. I. Smith, M. E. Wilson, and C. L. Patch, on whom fall the responsibility of procuring lecturers and organizing the course, wish to express their gratitude to the members of the staffs of various government departments who delivered lectures.

For many donations and exchanges and for advice and assistance from specialists in certain fields of scientific investigation the Acting Director wishes to express his appreciation. Thanks are also due for the co-operation and assistance of the Canadian National Parks, Forestry, and Northwest Territories and Yukon Branches of the Department of the Interior, the Entomological Branch of the Department of Agriculture, and the Royal Canadian Mounted Police.

Miss Marie C. Stewart, Herbarium Assistant, retired on superannuation in November, 1928, after twenty-seven years service.

## ANTHROPOLOGICAL DIVISION

D. Jenness, Chief of the Division, reports:

## FIELD WORK

Five parties were engaged in field work during the summer of 1928. H. I. Smith made systematic collections of archæological and ethnological specimens in southern British Columbia, and took motion pictures of the Kootenay, Salish, and Blackfoot tribes; C. M. Barbeau continued his studies of French-Canadian art and handicrafts in Quebec; W. J. Wintemberg, after examining some prehistoric Indian camping sites on Richelieu river, reconnoitred the north shore

of the gulf of St. Lawrence from the strait of Belle Isle to Tadoussac; Dr. J. C. Boileau Grant, Professor of Anatomy in the University of Manitoba, made an anthropometric investigation of the Cree and Chipewyan Indians on lake Athabaska; and C. B. Osgood, of the University of Chicago, travelled down Mackenzie river to Norman where he has undertaken to make, during the winter of 1928-1929, a complete ethnological study of the Hare Indians.

The field work of H. I. Smith added 323 ethnological and 53 archaeological specimens to the Museum's collections, together with more than 4,500 feet of motion-picture film. The Indian tribes are now so civilized that it is very difficult to obtain specimens of their earlier tools, weapons, and household furniture, no examples of which will be available a few years hence. The division is, therefore, making a special effort to enlarge its collections while it is still possible, and attempting at the same time to secure photographic records of the fast vanishing native life. It now has material for motion-picture films of six different tribes, five in British Columbia and one on the plains.

C. M. Barbeau spent the field season in Quebec city and its vicinity studying, photographing, and copying historical records concerning the carvings, paintings, and handicrafts of French Canada. In September he attended, with D. Jenness, the meetings of the International Congress of Americanists in New York, where he read a paper on "The Origin of Floral and other Designs among the North American Indians" that outlined some of the results obtained from previous researches.

W. J. Wintemberg made two notable archaeological discoveries during the summer. On the north shore of the strait of Belle Isle he found a camping site of the extinct Beothuk Indians of Newfoundland, thereby proving that they occupied at one time the southeast corner of Labrador peninsula. He discovered also a camping site of the Iroquois Indians near Kegashka, which is several hundred miles east of the known range of Iroquois forays.

Dr. Grant secured measurements and observations of a large number of Indians at lake Athabaska which provided, among other results, valuable conclusions concerning the physiological effects of Indian and white admixture. Blood tests obtained confirmed the theory that the pure blood natives do not possess either of the agglutinogens that are generally present in European and Asiatic peoples, a difference that may prove to have an important bearing on the problem of the origin of our native races in America.

A letter from C. B. Osgood, written just before Christmas and received two months later, stated that he was wintering with a small band of Hare Indians at the outlet of Great Bear lake. Influenza had been very rife among the natives and the fishing was poor, so that they were suffering considerable hardships. His work, nevertheless, was proceeding favourably.

#### OFFICE WORK

The division published two scientific reports during the past year: "A Comparative Vocabulary of the Western Eskimo Dialects," by D. Jenness; and "The Uren Prehistoric Village Site, Oxford County, Ontario," by W. J. Wintemberg. Two other reports have been submitted for publication: "Totem Poles of the Skeena River," by C. M. Barbeau; and "Anthropometry of the Cree and Ojibwa Indians in Northeastern Manitoba," by Professor J. C. Boileau Grant. A preliminary report on the "Anthropometry and Blood Groupings of the Cree and Chipewyan Indians of Lake Athabaska," covering Professor Grant's field work during the summer, has come to hand. W. J. Wintemberg is completing a report on the "Roebuck Village Site in Southeastern Ontario," D. Jenness is preparing a textbook on the "Aborigines of Canada," and C. M. Barbeau a monograph on the "Songs of the Tsimshian." C. M. Barbeau published, jointly with Dr. Ernest MacMillan, a volume of French-Canadian folk-songs entitled "Twenty-one Folk Songs of French Canada," and D. Jenness had an article on the physiography and archæology of Little Diomedé

island, Bering strait, in the Geographical Review for January, 1928. The latter also furnished extensive notes on the Indians of Canada to the Bureau of Ethnology, Washington, and revised for that institution a lengthy article on the Eskimos.

The division supplied material for five outside exhibits during the past year. A series of French-Canadian specimens was loaned for the Canadian Folk-Lore Festival held at Quebec in May; in August a large number of specimens from various parts of Canada were loaned in connexion with the centenary celebration at Pembroke, Ontario; in the autumn the Canadian National railways was supplied with Pacific Coast Indian specimens for two exhibits, one in Chicago and the other in Toronto; and in November a series of old Iroquois specimens was loaned to the Buffalo Academy of Science to fill out a special exhibit being arranged by that institution.

Dr. A. Hrdlicka, Curator of Physical Anthropology in the Smithsonian Institution, Washington, and Mr. Walter B. Cline, of Harvard University, spent several days at the Museum in the course of the summer studying its Eskimo and Salish crania. Professor R. R. Gates, of King's College, London, also visited the Museum to obtain information concerning the Indian tribes of Mackenzie River basin.

#### MUSEUM WORK

In the west anthropological hall are the exhibits devoted to the Nootka Indians of Vancouver island; these have been rearranged. Many are old and of considerable value, and should prove both attractive and instructive to the visiting public. The east anthropological hall is now equipped with fifteen large exhibition cases that only require diaphragms to make them available for immediate use. One case has already been supplied with a temporary diaphragm in order to display the fine collection of Stoney Indian specimens presented by Mr. Martin Nordegg; and a second case contains an experimental exhibit of basketry arranged on glass shelves.

#### *Accessions to Museum*

The anthropological collections of the Museum were augmented during the year as follows:

	Specimens
Ethnological .....	406
Archaeological .....	380
Osteological .....	12
Total.....	<u>798</u>

The majority of these specimens were collected by H. I. Smith and W. J. Wintenberg in the course of field work, but the list includes the Nordegg collection of old Stoney Indian specimens, referred to above.

### BIOLOGICAL DIVISION

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

#### FIELD WORK

In April, 1928, R. M. Anderson visited the Royal Ontario Museum of Zoology, Toronto; the United States National Museum, Washington; the American Museum of Natural History, New York; and made notes on specimens of Canadian mammals on exhibit as well as of methods of arranging and exhibiting zoological and botanical specimens. While in Washington Mr. Anderson attended the Tenth Annual Meeting of the American Society of Mammalogists, April 10-14, and during the course of the meeting read a paper on

"The Bowhead Whale in the Western Arctic." Mr. Anderson left Ottawa on July 14 to accompany the Canadian Arctic Expedition of 1928. This expedition, under the direction of Mr. George C. Mackenzie, Northwest Territories and Yukon Branch, Department of the Interior, sailed from North Sydney, Nova Scotia, on July 19, and its itinerary included Greenland and the chief islands of the Canadian Arctic region. Considerable information was obtained from members of the Royal Canadian Mounted Police, visited at seven different points, on the occurrence of big game, sea mammals, and bird life in their districts, and several members of the police had made valuable collections for the National Museum. Traders at the posts visited were also able to furnish much valuable information. The present range and number of the barren-ground caribou, Peary caribou, musk-ox, Atlantic walrus, narwhal, white whale, ringed seal, harbour seal, harp seal, and other species were checked and revised. The collections made included 108 birds and 19 mammals.

P. A. Taverner, assisted by C. G. Harrold, commenced ornithological investigations in the latter part of May at Matamek, about 8 miles east of the mouth of Moisie river, on the north shore of the gulf of St. Lawrence. Mr. Taverner and Mr. Harrold were for the greater part of the summer the guests of Mr. Copley Amory, to whom thanks are due for courtesies and assistance in the work. Most of the time was spent in studying land birds: 326 birds and 61 mammals were collected.

M. O. Mahe, Chief Botanist, National Herbarium, went to points on the Labrador coast, the coast of Hudson strait and Hudson bay, on board the Hudson's Bay Company's steamship *Nascopie*, for the purpose of making botanical collections and obtaining information concerning the flora in these districts. Approximately 6,000 herbarium specimens of flowering plants and ferns were secured, and acknowledgment is due Rev. H. A. Turner, for assistance in collecting these specimens. New species and varieties were obtained, as well as ample material for the interpretation of difficult and hitherto little understood genera. Among the new plant-geographical records obtained were fifty from Southampton island alone.

H. M. Laing was employed temporarily as assistant zoologist during the field season, and continued the work of collecting mammals and other material along the southern boundaries of British Columbia. He collected 481 mammals and 56 birds, together with material for several habitat groups of birds and small mammals.

H. M. Raup, assisted by Mrs. H. M. Raup, made a botanical survey of the southeastern section of Wood Buffalo park, Alberta, and collected about 6,600 herbarium specimens during the season. He also investigated the habits and range conditions of the buffalo that inhabit the district.

C. G. Harrold was employed temporarily as assistant zoologist during the summer of 1928. For several weeks in the early part of the season he collected cranes in the southern section of Saskatchewan, and later he assisted P. A. Taverner in field work referred to above.

C. L. Patch, D. Blakely, C. E. Johnson, and J. Rochon collected material in Ottawa district during the field season.

#### OFFICE WORK

A second edition of 10,000 copies of "The Birds of Western Canada," by P. A. Taverner (Museum Bulletin No. 41), was published during the year, the first edition having been exhausted.

A report by J. D. Soper, entitled "A Faunal Investigation of Southern Baffin Island" (Museum Bulletin No. 53, Biological Series No. 15), was also published.

R. M. Anderson prepared a paper on "The Work of Bernhard Hantzsch in Arctic Ornithology", which was published in "The Auk" in October, 1928.

Another paper by Mr. Anderson on "The Fluctuations in the Population of Wild Mammals and the Relationship of this Fluctuation to Conservation" was read at the Dominion Provincial Game Conference in Ottawa on January 26, 1928, and was published in "The Canadian Field Naturalist" in November, 1928. A translation of Hantzsch's "Contribution to the Knowledge of the Avifauna of Northeastern Labrador" ("Beiträge zur Kenntnis der Vogelwelt des nordöstlichen Labrador"), published in the *Journal für Ornithologie*, was completed by Mr. Anderson and Mrs. Anderson and was published serially in "The Canadian Field Naturalist."

M. O. Malte continued work on Arctic and other flora in the National Herbarium. An important paper by Mr. Malte on "Commercial Bent Grasses (*Agrostis*) in Eastern Canada" was published in the Annual Report of the National Museum of Canada for 1926. This report also contained an annotated article by P. A. Taverner on "Ornithological Investigations near Belvedere, Alberta."

#### MUSEUM WORK

Some progress has been made in installing biological exhibits in the Museum. Several habitat groups of birds and small mammals have been prepared and some old single specimens have been remounted. It has not been possible to do much new work connected with the exhibit of large specimens owing to the lack of exhibition space.

Arrangements have been made with the Forestry Branch, Department of the Interior, to commence an exhibit of the different varieties of wood found in Canada and also some important forestry products.

The Honorary Curator of Entomology, Mr. Arthur Gibson, Dominion Entomologist, is making arrangements to install some new entomological exhibits.

The Commissioner of Canadian National Parks has kindly continued to send to the Museum many specimens of large game predatory and fur-bearing mammals from the national parks, and the Commissioner of the Royal Canadian Mounted Police has, as in former years, sent in valuable material collected in the far north by various detachments of his force.

#### *Accessions to Museum*

##### Accessions to the zoological collections:

Mammals received and catalogued.....	748
Birds received and catalogued.....	686
Amphibians and reptiles received and catalogued.....	114

##### Plants received outside of collections made by staff:

Mr. H. Groh, Central Experimental Farm, Ottawa.....	31
Mr. Norman Criddle, Entom. Branch, Dept. of Agric., Ottawa.....	2
Dr. M. Porsild, Godhavn, Greenland.....	69
Dr. Selin Birger, Stockholm, Sweden.....	125
Bro. Louis-Marie, Oka, Que.....	100
Prof. Marie-Victorin, Montreal, Que.....	224
The Hungarian National Museum, Budapest, Hungary.....	100
United States National Museum, Washington, D.C.....	94
Gray Herbarium, Cambridge, Mass.....	15

Grateful acknowledgment is made of the receipt of an interesting collection of plants from Bylot island, made by Inspector C. E. Wilcox, R.C.M.P., and collections of seed from Baffin island, made by Staff Sergeant J. E. F. Wight, R.C.M.P.

##### Plants distributed:

Division of Botany, Central Experimental Farm, Ottawa.....	10
Dr. F. S. Blake, Dept. of Agric., Washington, D.C.....	9
Dr. M. Porsild, Godhavn, Greenland.....	233
Gray Herbarium, Cambridge, Mass.....	86



## MINES BRANCH

*John McLeish, Director*

Reference was made in last year's report to the growth of the Mines Branch organization from a staff of 21 persons in 1907 to 98 in 1920, and to 151 in 1928.

The total number of employees at the end of March, 1929, was 170, of whom 32 were temporary, and included 60 administrative officers, engineers and chemists, 12 technical clerks and draughtsmen, 25 clerks and stenographers, 20 laboratory assistants in several grades, and 53 mechanics, labourers, and messengers.

The Director, in addition to his departmental administrative duties, attended the regular meetings of the Dominion Fuel Board, and acted as chairman of several sub-committees of this board, the work of which required a considerable amount of time. He attended, as a member, several meetings of the Advisory Committee on Mining Regulations, and meetings of several Associate Committees of the National Research Council, and was authorized to accept an appointment to the Government Advisory Committee on the Civil Service Superannuation Act.

In May, accompanied by Mr. Haanel, Chief of the Division of Fuels and Fuel Testing, he attended, on invitation, the organization meeting in Halifax of a new Nova Scotia Provincial Advisory Board on Fuel Investigations and laid the basis for co-operative work between the Dominion and Provincial organizations investigating fuels.

During August and September, he accompanied Mr. W. B. Timm, Chief of the Ore Dressing Division, on an inspection of western ore treatment mills and metallurgical plants, and had an opportunity of observing and of learning directly from the mill and smelter operators the high value of the services which our ore-dressing investigational work is rendering the industry. A visit was made to the smelter at Tacoma in the state of Washington, where large quantities of copper ores from British Columbia are being shipped for treatment, and to Kellogg, Idaho, to inspect the new Tainton process zinc plant which was just being placed in operation and which, it is claimed, is producing a grade of zinc so high as to command a premium on the market. Conferences were also had, and contracts renewed, with the mining departments of the several western provinces.

In November, he attended the Second International Conference on Bituminous Coal at Pittsburgh, and, in March, the annual meeting of the Canadian Institute of Mining and Metallurgy at Winnipeg.

Investigations of mineral resources, with particular respect to distribution, mining, technology, uses, and markets were carried on by eleven investigators under the Chief of the Division of Mineral Resources. The subjects upon which special investigations were undertaken included asbestos, feldspar, mica, gypsum, salt, bituminous sands, limestone, moulding sands, gold mining, and silver mining, and a comprehensive survey of domestic fuel consumption in Quebec, Ontario, and Manitoba. Close contact was kept with the mining industry generally, on the basis of which a 45-page review on "The Canadian Mineral Industry in 1928" was prepared and issued in March, 1929.

Probably the most significant progress made during the year in the ore dressing and metallurgical work has been the beginning made in the construction and equipment of a pyro-metallurgical laboratory for investigations on the concentration of iron ores, the production of iron and steel and of steel

alloys, and the heat treatment of steels. It is anticipated that material assistance will be afforded the Canadian iron and steel industry through the work that will be undertaken in this laboratory. The progress being made in the development of Canada's mineral resources is being reflected in the increased demand for test and research work on the treatment of complex ores, and it is a matter of considerable satisfaction to know that the results demonstrated in our laboratories are being taken advantage of in many of the mills now under construction. Many metal ores which could not be considered of commercial value ten or fifteen years ago are today being successfully mined and treated because of the improvements that have been made in old processes and the development of new processes for their treatment as a result of continuous and widespread scientific test and research work.

The new fuel research laboratory building at Ottawa was approaching completion at the end of the year, and considerable progress had been made in the installation of the large-scale coking plant and the powdered fuel boiler plant.

Representatives of the Mines Branch, in co-operation with representatives of the Geological Survey and of the Dominion Coal Company and the Nova Scotia Department of Mines, met at Sydney in June, and arranged for a beginning of a chemical and physical survey of one of the coal seams of Sydney area. Some thirteen lines of investigation are under way in the laboratory studies of Canadian solid, liquid, and gaseous fuels. Officers of the staff are members of both Canadian and United States committees on coal classification standards, and the staff of this division is keeping in close touch with the progress of fuel investigations in the United States and in Europe, especially in respect to the burning of coal in the pulverized form, the carbonization of coal at both high and low temperatures, and the more complete production of oils from coals. Additional research work along these lines is being planned to be undertaken in the new fuel research laboratory.

Eleven major investigations were in progress during the year in ceramics and road materials, all of which have a definite bearing on the development of industry and the utilization of Canadian resources. One of these investigations, viz., "the treatment of certain western clays to overcome drying defects", was productive of such valuable economic results that immediate publicity was given thereto through, first, a mimeographed report, followed by papers contributed to the American Ceramic Society, and the Canadian Institute of Mining and Metallurgy.

Both the clay and road materials work carried on during the year in Prince Edward Island have been of particular interest and value to the provincial authorities in that province.

## MINERAL RESOURCES DIVISION

The Chief of the Division of Mineral Resources, A. W. G. Wilson, spent about two and one-half months on field service, one month of this time being devoted to special investigations on behalf of the Advisory Board on Tariff and Taxation. In company with J. G. Ross three weeks were devoted to a study of current progress in the asbestos industry in Quebec and to visits to a number of industrial plants in the United States where asbestos products are fabricated. Three weeks were spent with S. C. Ells in Alberta inspecting drilling operations on the bituminous sands on Athabaska river, below McMurray. On this trip two localities suitable for new quarry sites were selected and arrangements were made for drilling and sampling; officials of the Saskatchewan Government were consulted in connexion with a proposed experimental demonstration of road

surfacing with bituminous sand products. As in the previous year, the services of the Chief of the Division were requisitioned by the Advisory Board on Tariff and Taxation, about one-fifth of his time being given to this work. One month was spent on special field investigations; a number of reports were compiled in the office; and he was in attendance at hearings dealing with mining machinery, coal, steel, copper rods, cement, plate glass, and ethylene glycol, being subject to call for information or evidence upon a number of occasions.

H. S. Spence was engaged during the field season in resurveying the feldspar and mica industries. Not only were field investigations made in Canada, but these studies were extended to include developments in eastern United States and in South Dakota. The results of this work will be embodied in two bulletins now nearing completion. The investigation of Canadian flake graphite, instituted last year, was still in progress; flake graphite was recovered in the ore dressing laboratories of the Mines Branch from ore procured by Mr. Spence in 1927. This product was later dispatched to the Morgan Crucible Company in Great Britain for testing.

L. H. Cole was engaged in securing the necessary field data for the completion of bulletins on the gypsum and on the salt industry of Canada. During the progress of the work large samples of gypsum were procured from the various Canadian occurrences and subjected to large-scale laboratory tests in Ottawa; the results of these tests will appear in the new bulletin. Samples of brines from salt springs or wells in the Maritime Provinces were also procured for laboratory investigation. Recent advances in the technology of gypsum, gypsum products, and salt in both Canada and the United States are being studied preparatory to the completion of these reports.

S. C. Ells continued his work in McMurray area in developing methods of drilling and sampling deposits of bituminous sands; this testing work has now been completed. If any further experimental demonstration work is carried on, a new quarry site from which material can be procured is required; two possible sites for this purpose were selected and sampled by drilling. All samples obtained during the season's drilling operations were forwarded to the laboratories at Ottawa for examination. Tentative designs for a new portable heating and mixing plant for preparing asphaltic mixes for demonstrations in road surfacing were prepared, and the mixing drums and mountings were purchased; no progress was made in the construction of the plant. Mr. Ells spent about four months in Europe, part of the time being on leave, but he also utilized the opportunity to make a comparative study of European rock asphalt deposits and secured extensive information about the commercial methods employed in the preparation of these raw materials for use; a comprehensive report covering this investigation is in course of preparation.

M. F. Goudge continued the systematic survey of the limestone resources of Canada. The fourth season on this work was devoted to studies of the limestone resources of the Prairie Provinces and of British Columbia along some of the principal railway lines; work in this latter province will be completed next season. Late in the season visits were made to localities in western United States, where limestones and magnesites are produced, to study the latest technical developments in the industry.

A. H. A. Robinson is engaged primarily upon the compilation of a report on lode mining for gold ores in Canada. He also has reported on current progress in the mining of ores of base metals in central and eastern Canada. During the field season the principal metal mining camps in the Maritime Provinces, Ontario, Quebec, and Manitoba were visited.

V. L. Eardley-Wilmot is now engaged on the compilation of a monograph on silver. The assembling of material for this report necessitates studies of the history of the mining of silver-bearing ores in Canada, discussions of current

technology in the recovery of silver from these ores, and an investigation of markets, uses, and applications of the metal in the arts and crafts. During the past season visits of inspection were made to Cobalt area, Ontario, and to the silver-lead-zinc mines of British Columbia. During the autumn a short trip was made to certain mines in Quebec where silver is produced as a by-product.

Arthur Buisson, mineral technologist in charge of the records section of this division, spent two months visiting the principal mining centres of northern British Columbia and the Pacific coast. This season's work was in continuation of a practice initiated some years ago to procure for the records first-hand information about current developments and local conditions in the various mining districts of the country. Based on this work a number of short articles for distribution to the press have been prepared by Mr. Buisson.

C. H. Freeman, junior engineer attached to the records section, was employed in studying conditions in the sand and gravel industries in the Maritime Provinces and in Ontario and Quebec. Inquiries were also instituted to ascertain the sources from which Canadian foundries are drawing their moulding sands; large samples of Canadian sands apparently suitable for use in this way were procured for laboratory examination, and this latter investigation is now in progress.

E. H. Wait, junior engineer attached to the records section, was employed in studying current conditions in the areas north of lakes Huron and Superior where prospecting and mining development are in progress. Mr. Wait also made some preliminary inquiries into the present status of the ochre industry in Quebec.

John Casey, statistician attached to this division, conducted the second survey of fuels used for domestic heating. The first survey covered only Ontario and Quebec; this year the work was expanded to include Manitoba. Information was collected respecting the source of supplies and the quantities consumed of the following sources of heat: coals and cokes, charcoals, briquettes, gases, both natural and artificial, fuel oil, electric energy, and such other fuels as are used for domestic purposes. In all, nine hundred and twenty-eight municipalities and the operations of about thirty-two hundred domestic fuel distributors were covered. Much of the survey was conducted by circular letter and correspondence, but it was also necessary to follow up written inquiries by personal visits to distributors; two hundred and forty-five municipalities were visited during eleven weeks' field work.

J. G. Ross, consulting mining engineer, was engaged to prepare a monograph on asbestos and the asbestos industries. During the year he studied operations at the mines in Quebec, and also inspected factory operations at many points in the United States. On part of these examinations he was accompanied by Mr. Wilson, Chief of the Division. Later in the autumn Mr. Ross also visited producing localities in the states of Arizona, New Mexico, and California to study operations there. The results of these investigations are embodied in a report that is now in process of publication.

## ORE DRESSING AND METALLURGICAL DIVISION

W. B. Timm, Chief of the Division, reports an increase in the amount of investigative work on ore treatment as the result of greater activity in the mining industry. The assistance being given in connexion with ore treatment problems is becoming more widely known to the operators of mining properties, and, consequently, the ore testing laboratories are taxed to their limit to meet the demands for investigative work. At the close of the year, the work in progress and on hand was sufficient to keep the present staff with the present laboratory

facilities, busily engaged for some time. More laboratory space is urgently required in order to take care of the increasing number of applications and requests for experimental test work resulting from the rapid expansion of the mining industry in Canada.

The permanent staff was increased during the year by the appointment of T. W. Hardy, a specialist on iron and steel metallurgy. He will be in charge of the iron and steel section of the division. A pyrometallurgical laboratory is in course of erection and will be equipped for investigations on Canadian iron ores, and iron and steel products. The other sections of the division are as follows:

The ore dressing section for metallic ores, with C. S. Parsons, engineer in charge.

The ore dressing section for non-metallics, with R. K. Carnochan, engineer in charge.

The hydrometallurgical and electrochemical section, with R. J. Traill, engineer in charge.

The chemical section, with H. C. Mabee, chief chemist, in charge.

The co-operative arrangements entered into with the Base Metal Extraction Company Limited and the Cassel Cyanide Company of Canada, Limited, were still existent. Considerable progress was made in the working out of details of the Base Metal Extraction Company's process for the treatment of bulk concentrates from base metal sulphide ores. The company is looking into the possibility of establishing in eastern Canada, a plant for the treatment of such concentrates from the more complex ores which are difficult to concentrate by selective flotation methods. Progress was made by the Research Fellow maintained by the Cassel Cyanide Company, on the use of cyanide for the selective flotation of the base metals sulphides, especially the copper-zinc-iron sulphide ores.

W. B. Timm spent three months in the field securing information on the progress in ore dressing and metallurgical practice and in renewing personal contact with those engaged in the mining industry. C. S. Parsons spent two months in the field visiting ore concentration and metallurgical works in south-western United States to obtain information on recent developments in ore dressing and metallurgical practice. T. W. Hardy visited the iron and steel plants in Ontario, securing information regarding their activities and metallurgical practice. A. K. Anderson spent six weeks in Rouyn area, western Quebec, investigating certain problems related to the concentration of the copper-zinc ores of that area. J. S. Godard spent a week in the central Manitoba gold mining district investigating problems related to the milling of the ores.

T. W. Hardy and H. C. Mabee devoted considerable time to the preparation of plans for the new pyrometallurgical laboratories and to the alterations to the old fuel testing laboratories, to provide increased laboratory facilities for the division. On request of the Chairman of the Tariff Board, T. W. Hardy was detailed to act in a consulting and advisory capacity to the board on matters pertaining to the iron and steel industry.

#### LABORATORY INVESTIGATIONS IN ORE DRESSING AND METALLURGY

C. S. Parsons, A. K. Anderson, and J. S. Godard conducted the investigations on the treatment of metallic ores as follows:

- Lead ore from the Ogema mine, Dorion, Ont.
- Copper-gold ore from the Horne mine, Noranda, Que.
- Copper-zinc ore from the Abana mine, Dupuy, Que.
- Gold ore from the Grace mine, Michipicoten, Ont.
- Gold ore from the Malartic mine, Amos, Que.
- Copper-molybdenum ore from the Golconda mine, Keremeos, B.C.
- Copper-zinc ore from the Sherritt Gordon mine, Cold Lake, Man.
- Copper-zinc ore from the Amulet mine, Rouyn, Que.

Lead-zinc ore from Larchwood, Ont.  
 Gold ore from the Second Relief mine, Erie, B.C.  
 Copper-gold ore from Oxford lake, Man.  
 Copper-zinc-pyrite ore from the Aldermac mine, Aldermac, Que.  
 Silver-lead-barite ore from the Homestake mine, Adams Lake, B.C.  
 Arsenical-gold ore from Cameron island, lake of the Woods, Ont.  
 Copper ore from the Hollinger-Kamiskotia mine, Kamiskotia, Ont.

R. K. Carnochan and R. A. Rogers conducted the investigations on the concentration and preparation of non-metallics as follows:

Asbestos from Sproat mountain, Arrowhead, B.C.  
 Limestone from L'Etang, N.B.  
 Soapstone from Robertsonville, Que.  
 Calcite from the Frontenac lead vein, Perth Road, Ont.  
 Oyster shells from Orangedale, C.B.  
 China clay from St. Remi, Que.  
 Garnet from Labelle, Que.

The investigation on the concentration of Canadian graphite from typical Canadian occurrences for the manufacture of crucible flake was conducted by C. S. Parsons and R. K. Carnochan. Concentration tests were conducted on two carload shipments from Buckingham and Guenette, Quebec.

R. J. Traill, W. R. McClelland, and J. D. Johnston conducted the following investigations:

The hydrometallurgical treatment of high-grade iron-copper concentrates for the recovery of the copper and precious metal values; of the iron content as electrolytic iron and the sulphur as elemental sulphur.

The roasting and direct reduction of the high sulphur magnetite iron ore of the Bristol mine, Bristol Mines, Quebec.

The metallization of the iron content in ilmenite ore from Ivry, Quebec, by means of rotary kiln type of furnaces.

H. C. Mabee, chief chemist, reports that a total of 1,736 reports of analysis were issued during the year, which involved over 7,000 determinations. During the same period Mr. Mabee conducted an investigation on the manufacture of calcium molybdate from Canadian molybdenite concentrates.

## FUELS AND FUEL TESTING DIVISION

B. F. Haanel, Chief of the Division, reports greatly increased activity in both investigational and routine work. The new fuel research laboratory building was completed and a start made on the installation of small and large scale experimental equipment, the most important of which was a semi-commercial by-product coke oven and a pulverized fuel boiler. A good beginning was also made on a comprehensive chemical and physical survey of the Phalen seam in Nova Scotia, the field work of which was conducted in co-operation with the Geological Survey, the Nova Scotia Provincial Government, and the Dominion Coal Company. Peat manufacturing operations were conducted at the Alfred peat bog from May 15 to September 15, 1928.

The technical staff of the division was increased by the appointment of H. McD. Chantler as chemist. J. L. Bowlby, assistant chemist, resigned to accept a position in a commercial coal laboratory. E. Swartzman was appointed as junior chemist.

The investigational and research work of the division, under R. E. Gilmore, superintendent of the fuel testing laboratory, was organized into five sections, under the immediate charge of an engineer or chemist, as follows:

Mechanical engineering.....	E. S. Malloch
Coal carbonization and briquetting .....	R. A. Strong
Oil-shale investigations .....	A. A. Swinnerton
Oils and natural gas .....	P. V. Rosewarne
Chemical laboratory (solid fuels) .....	J. H. H. Nicolls

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

In addition to planning and directing the work of the division, Mr. Haanel attended the regular meetings of the Dominion Fuel Board, and devoted considerable time to details in connexion with the completion of the new fuel research laboratories and equipment. A part of his time was spent in supervising the investigation conducted at Alfred, Ontario, for the manufacture of peat fuel. Mr. Haanel went to England in August, where he presented a paper before the World Power Conference, and spent two months visiting the most promising of the coal processing plants in the British Isles and on the Continent. He made several trips to Montreal at the instigation of the Canadian National railways for consultation in connexion with low-temperature carbonization, and also had conferences with the Fuel Purchasing Department of that railway regarding an investigation concerning the weathering of coal stored in large open piles and its liability to spontaneous combustion. He went to Toronto to discuss with Mr. Piron the Piron process for low-temperature carbonization. In November he attended the Second International Conference on Bituminous Coal held at Pittsburgh, and visited the United States Bureau of Mines at Washington. During the year Mr. Haanel attended two meetings of the Nova Scotia Advisory Board of Fuel Investigation at Halifax.

E. S. Malloch and C. E. Baltzer, in addition to their routine duties, jointly conducted and reported on a series of tests on the fire setting propensities of slag dropped from oil-burning locomotives for the Fire Inspection Department, Board of Railway Commissioners; and jointly prepared three papers entitled: "Industrial Fuel and Power Statistics for Ontario, Calendar Year 1925"; "The Use of Gas and By-Product Cokes for Domestic Heating Purposes"; and "Directions for Domestic Use of Peat Fuel". During the year Mr. Baltzer examined and reported on the preliminary operation of the pulverized fuel equipment installed on board the Dominion Coal Company's steamship *Lingan*; witnessed and reported on a series of tests made on the pulverized fuel fired boilers of the Canada Electric Company, Limited, at Maccan; and visited a number of pulverized fuel fired boiler plants in eastern and western Canada.

R. E. Gilmore was largely occupied with the details pertaining to the completion of the new laboratory building, in which work he was assisted by V. A. Minnes. In addition to his regular supervising duties, he assisted in planning the laboratory work of the division. Other work requiring his special attention was: special reports on a quarter-ton sample of brown lignite coal submitted by the Ontario Department of Mines, and on the bituminous coals of the Maritime Provinces in relation to their suitability for various low-temperature carbonization processes. He also attended the Second International Conference on Bituminous Coal held in Pittsburgh, and studied the work of both the Canadian and American Coal Classification Committees.

R. A. Strong, assisted by E. J. Burroughs, completed the underground sampling in connexion with the chemical and physical survey of the Phalen coal seam and made a preliminary survey of the coal preparation and shipping methods practised for Nova Scotia coals. He also assisted the superintendent in respect to the winter storage of run-of-mine railway coal and slack coal from the Maritime Provinces at the stock piles in Montreal. With Mr. Burroughs' assistance, he conducted comparative, high and low temperature carbonization tests on the Phalen seam composite samples, and made a study of the variation in respect to fusibility of ash of certain sectional samples. Mr. Strong represented the division at the annual meetings of the A.I.M.M. and C.I.M.M. at

New York and Winnipeg, respectively, and was a member of the Canadian delegation at the Second International Conference on Bituminous Coal held at Pittsburgh.

A. A. Swinnerton and G. P. Connell paid special attention to laboratory work pertaining to oil-shales and bituminous sands. In addition to reporting on Canadian oil-shale developments, Mr. Swinnerton conducted a month's field work in Pictou area, Nova Scotia, where he sampled the most promising outcrops from which composite and sectional seam samples were obtained for laboratory test and record as to their oil-bearing properties. Mr. Connell conducted the laboratory testing on the samples of bituminous sands submitted by the Mineral Resources Division, particularly as to the standardization of methods of analysis pertaining to the same.

P. V. Rosewarne worked on Canadian crude oil and natural gas resources, in which connexion he visited the producing fields in southern Ontario and Alberta. In addition to completing the collection of representative crude oil samples from both south and west, he studied the basic natural gas situation in the Turner Valley and other Canadian fields, concentrating a large part of his effort on the recovery of helium and other valuable constituents in the gas. Assisted by Messrs. H. McD. Chantler and R. J. Offord, he made progress on the examination of the crude oil survey samples, conducted the sixth annual gasoline survey, and enlarged his manuscript re standard methods of analysis for oil to include gasolines and illuminating oils, as well as lubricating oils. He also represented the division at the spring meeting of the American Chemical Society, at St. Louis, and visited the United States Bureau of Mines Experiment Station at Bartlesville, and several natural gas producing and refining companies in Oklahoma.

J. H. H. Nicolls, besides looking after the indexing and compiling of analytical results on solid fuels, conducted further experiments on the caking index values of Canadian bituminous coals. He assisted in field work in connexion with the Phalen seam sample taking, and with the assistance of Mr. Swartzman, conducted "forms of sulphur" work on the survey coal samples. Mr. Nicolls also devoted some time to the standardization of coal analyses methods and continued his study of the application of different schemes for classifying Canadian coals according to chemical characteristics.

### *Chemical Laboratory Work*

C. B. Mohr was assigned immediate charge of the proximate analyses and calorific value work on solid fuels according to standard laboratory methods, in which work he was assisted by G. P. Connell, and a junior staff.

H. McD. Chantler, assisted by R. J. Offord (and a junior staff) attended to the analytical work pertaining to samples of liquid fuels coming in from other government departments, commercial firms, and private individuals.

During the year a total of 1,376 samples of solid, liquid, and gaseous fuels were examined. Of these 700, that is, approximately 51 per cent of the total, were sent in from other divisions of the Mines Branch, from the Geological Survey, from other government departments, from public institutions, commercial firms, and private individuals. The remaining 49 per cent pertain to investigations conducted by the technical staff of the division. Of the total samples submitted from outside the division, 398 were from other divisions of the Mines Branch, mainly from the Mineral Resources Division, 49 from the Geological Survey, 99 from the Department of Soldiers' Civil Re-establishment 57 from



other government departments, and 97 from public institutions, commercial firms, and private individuals. The following is a classification of the various kinds of fuels analysed:

Solid fuels; total samples examined.....		559
Coals (various kinds).....	447	
Cokes and chars.....	82	
Peat and miscellaneous.....	30	
Liquid fuels; total samples examined.....		326
Gasoline.....	249	
Lubricating oils.....	12	
Crude oils.....	42	
Other petroleum, oils, and miscellaneous.....	23	
Gases from coals, oil-shales, etc.....		65
Oil-shales.....		37
Bituminous sands.....		389

### *Work Performed by the Mechanical Staff*

A. W. Mantle, mechanical superintendent, reports increased activity in the mechanical section. This was largely due to additional work done in connexion with the removal to and erection of equipment and machinery in the new Fuel Research laboratories. He acted in an advisory capacity in regard to the operation, supervision, and alteration of machinery used in the peat manufacturing operations at Alfred.

#### PEAT OPERATIONS AT ALFRED, ONTARIO

E. V. Moore, engineer in charge of peat fuel manufacturing operations at Alfred, reports that the peat manufacturing plant was put in operation on May 15, and was operated for a period of 2,132 hours, of which time the plant actually manufactured peat fuel during 1,197½ hours; the balance of the time was lost largely through abnormal weather conditions. The total quantity of fuel laid on the field was 10,000 tons, of which 5,400 were placed in storage or loaded on railway cars. In addition to this quantity, 750 tons were stored in the field. The fuel loaded on railway cars for shipment up to March 31, amounted to 1,211 tons, and fuel loaded for local sales 156 tons. The fuel on storage field, March 31, 1928, amounted to 4,116 tons, and the fuel in storage on drying field, 750 tons. The results of the season's operations demonstrated the commercial applicability of the plant, in that there were no serious break-downs, and repairs were less than the estimated amount. It was also demonstrated that under normal weather conditions, with equipment as it now stands, an average capacity of 17 tons of saleable peat fuel per hour could be produced, but with a larger motor on the macerator it would appear that the maximum capacity of 20,000 tons could be reached. The plant was closed up for the winter on December 22, but provision was made for loading fuel during the winter months.

#### CERAMICS AND ROAD MATERIALS DIVISION

Howells Fréchette, Chief of the Division, reports a continued growth in the activities of the division and much progress in the investigations in hand. The permanent technical staff was increased by the appointment of J. G. Phillips, ceramic engineer, on July 14, 1928.

During the year, a small, high-temperature gas-air furnace for the determination of the softening temperature of clays, and a gas-fired furnace for the testing of refractories under load, and other equipment were installed in the laboratories.

## CERAMICS

The investigation on the treatment of certain western (Prairie Provinces) clays to overcome drying defects, conducted by Mr. Fréchette and Mr. Phillips, referred to in last year's report, having been brought to a successful conclusion in the laboratory by April 1, 1928, full-scale tests were made at the plant of the Redcliff Brick and Coal Company, Limited, Redcliff, Alberta, in April, May, and June. In these tests the use of chemicals as a means of promoting rapid drying without cracking the bricks was tried under operating conditions. Such gratifying results were obtained in the tests that treatment was adopted for regular operation. This consisted of the addition of ferric chloride and common salt to the clay. Prior to the introduction of the process, drying the brick required from seven to eight days. This time was reduced to three days and the loss due to cracking was reduced from about 40 per cent to almost nothing. The output of the plant, which was controlled by the capacity of the dryers, was, consequently, very greatly increased and the quality of product improved. Notwithstanding the high extra cost for chemicals, the cost of manufacture has been reduced and the product sells for an increased price owing to the improved quality. The results attained at this plant serve to demonstrate what may be accomplished at a number of other plants in the Prairie Provinces where similar clays are used.

The success of chemical treatment as a means of improving the drying behaviour of clays in Alberta prompted a request from the Montreal Terra Cotta Company, Limited, for an investigation of the clay used by them for the manufacture of building tile to determine whether similar treatment would permit faster drying of their ware and reduce the loss through breakage. Since this clay is of a different type from that dealt with in the former investigation and similar to much of that occurring in St. Lawrence valley the problem was considered to be one that would develop new data on chemical treatment and, if successful, would be of general value to the clay workers of the district. A start on this investigation has been made by Mr. Phillips in the laboratory. Early tests indicate that chemical treatment may be looked to as a means of attaining a marked improvement in the drying of the ware.

A limited amount of laboratory work was done by Mr. Phillips on clay from Edrans, Manitoba, to improve, by the use of chemicals, the firing properties of the clay and the colour of the burned brick.

Considerable time was spent by L. P. Collin on the investigation for the production of grey brick. Six manufacturers have shown a very keen interest in this investigation. Samples of clay submitted by four of these have been mixed with varying percentages of limestone dust and manganese. A satisfactory grey has been developed in the laboratory from two of these clays and attempts have been made to duplicate this colour at the plants on a commercial scale, but without success. A new line of experiments must be followed, as no admixtures of limestone dust and manganese can produce with these clays a grey brick economically that will be of as high a quality as the imported brick.

The investigation of ceramic bodies for electrical heating devices is well on the way to completion. Bodies have been developed by Mr. Collin which have a much greater resistance to temperature change than those on the market. The one objectionable characteristic of these is their extremely high shrinkage. It is proposed to conduct further research to find a means of reducing this shrinkage.

The investigation of the clay and shale resources of Prince Edward Island, commenced in 1927, was completed by Mr. Fréchette who, during July and August, studied the various deposits and obtained samples for testing. These

samples are being tested in the ceramics laboratory by J. F. McMahon to determine their various properties and the industrial purposes for which they are suitable.

During the summer Mr. McMahon made a study of the excavation and transportation of clays at fifty brick and tile plants in Ontario and Quebec. Information as to the cost of the various operations was secured and much general data gathered which will serve in determining the most economic methods of operation under specific conditions.

During the year 136 samples of clays and shales were tested. Tests were made on two samples of mineral pigment, one sample of limestone, two samples of sericite, two samples of diatomite, and two samples of soapstone.

A number of refractory shapes were made for use in the ceramic laboratory and for other laboratories of the Department.

The research on the manufacture of high-grade refractory brick from Canadian magnesite continued throughout the year. This investigation is being made in co-operation with the National Research Council of Canada.

#### ROAD MATERIALS

R. H. Picher, road materials engineer, completed his surveys and sampling of the deposits of conglomerate and gravel in Prince Edward Island. During July, August, and September Mr. Picher examined twenty-five deposits of conglomerate or gravel, of which about seventeen proved to be of value as sources of road material.

One deposit of conglomerate and two of gravel were examined and sampled in New Brunswick at the request of the Provincial Department of Public Works.

The laboratory work consisted in testing the samples collected during the field season, and fifteen samples of rock and gravel submitted by the public, to determine their suitability for road purposes.

#### CHEMISTRY DIVISION

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

From April 1, 1928, to March 31, 1929, fourteen hundred and nine specimens have been reported on.

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

H. A. Leverin continued the investigation commenced in 1927 on the rate of drying of peat under the climatic conditions prevailing at Alfred, Ontario. He made complete or partial analyses of a large number of samples of widely varying materials comprising gypsums, sandstones, limestones, clays, boiler scales, alloys, titaniferous ores, calcined magnesites, antimony ores, copper ores, manganese ores, and one supposed bauxite. He also identified several mineral specimens.

E. A. Thompson made complete chemical analyses of ten samples of feldspar, nineteen samples of asbestos, and one mineral water. He also made several microscopic examinations, with photomicrographs, of specimens submitted by the Ore Dressing Division. He made a number of partial analyses necessary for identification and valuation of mineral specimens.

A. Sadler had charge of the furnace assays. He investigated the behaviour on heating with various re-agents of fourteen diatomites. Experiments were made on three silver-bearing ores to determine whether the sulphides of iron carried the silver values. He made numerous chemical analyses of the usual run of materials coming to the laboratory. These comprised: silica sands,

dolomites, magnesites, diatomaceous earths, graphites, clays, manganese ores, and bullion. He also assisted in the identification of mineral and rock specimens submitted by the general public.

James Moran has been mainly engaged on the analysis of the air sampled in the coal mines of western Canada. Two hundred and forty-five such samples have been analysed and reported on. He made partial analyses of a large number of limestones, assisted in the identification of minerals, and made tests of a number of rare or radioactive rocks and minerals. An investigation of the nature of the electric charge on insecticides, and the relation of this charge to the adhesive efficiency of such insecticides to foliage, was commenced and is not yet completed.

C. L. O'Brian was engaged in the analysis of limestones and dolomites collected by the Mineral Resources Division. He has been assisted during the latter part of the year by Mr. R. J. Young.

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

The report of the Assay Office for the calendar year ending December 31, 1928, shows that the net value of gold bullion deposited during the year amounted to \$1,673,926.65, as compared with \$1,750,599.35 during the previous year.

The value of gold bullion deposited from British Columbia sources was \$918,718.06, being a decrease of \$126,037.05, the greater part of which is accounted for by a falling off towards the latter part of the year in the amount of gold received from the Consolidated Mining and Smelting Company of Canada, Trail, B.C. Owing to the diversion of the Granby Company's Copper Mountain concentrates from Trail to Tacoma the Copper Smelter and Electrolytic Copper Refinery at Trail are temporarily idle. It is reported, however, that the Consolidated will maintain its services for the district's copper operations and will continue in the market for copper ores, thus in the future probably producing an equivalent, if not a greater, quantity of gold bullion. There is also to be noted a further decline during 1928 in placer gold production in British Columbia.

Gold bullion from Yukon territory amounted to \$693,765.40, an increase this year over 1927 of \$44,262.68.

Deposits from all other sources totalled in value \$61,443.19, an increase over the previous year of \$5,101.67.

The purchase and disposal of the gold bullion deposits during the year 1928 required a total of 1,560 meltings and 1,560 assays, quadruplicate assays being made in each instance. This includes 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 107,617.27 troy ounces, and after melting 98,425.51 troy ounces, included in which were 61 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 16,557.98 troy ounces and after melting and cupelling 9,097.32 troy ounces, showing a loss by melting and cupellation of 45.058 per cent.

The average loss in melting all other bullion deposited, viz., 91,059.29 troy ounces before melting and 89,328.19 troy ounces after melting, was 1.901 per cent.

The loss in weight by assaying (base and parted silver) was 32.53 troy ounces, making the weight of bullion after melting and assaying 98,392.98 troy ounces, the average fineness of same being 821½ gold and 130½ silver.

Very little platinum work was done during the year owing to the illness of the platinum metallurgist, and to the partial destruction by fire, on September 21, of the fume chamber in the platinum laboratory. Work on its reconstruction was commenced early in December.

Upon completion of the new fume chamber in the platinum laboratory, the fume chamber in the muffle furnace room in the assaying section will be demolished and a new one constructed in its place. Both old fume chambers were constructed many years ago and were transferred to their present quarters from the old premises.

The net value of the gold and silver contained in deposits was \$1,673,926.65 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.
<b>Bars, nuggets, dust, and amalgam—</b>					
British Columbia.....	390	56,661.06	48,724.77	918,718	06
Yukon Territory.....	390	42,993.43	42,440.34	693,765	40
Alaska.....	3	123.39	119.16	2,272	75
Washington.....	3	50.42	48.46	599	84
Alberta.....	4	76.85	75.08	1,394	58
<b>Dental and jewellery scrap.....</b>	<b>691</b>	<b>7,712.12</b>	<b>6,985.17</b>	<b>57,176</b>	<b>02</b>
	<b>1,481</b>	<b>107,617.27</b>	<b>98,392.98</b>	<b>1,673,926</b>	<b>65</b>

### DRAUGHTING DIVISION

H. E. Baine, Chief Draughtsman, reports:

#### Maps Prepared for Publication During the Fiscal Year Ending March 31, 1929

Map No. 693. Mineral Map of Canada; scale 1 mile to 1 inch. Twelve maps to accompany "Industrial Fuel and Power Statistics for Ontario (Calendar year 1925)."

#### In Preparation

Map 703. Principal amber mica mines and occurrences in the province of Quebec; scale 3.95 miles to 1 inch.

Map 704. Principal amber mica mines and occurrences in the province of Ontario; scale 3.95 miles to 1 inch.

One hundred and thirty-nine page maps, drawings, charts, and flow-sheets were prepared during the year.

Nine hundred and ninety-five negatives, black and white and blue prints were made from the blue-print machine.

Twelve hundred and four negatives, and black and white prints were made from the photostat machine.

Three hundred and nine halftone blocks and zinc cuts were sent out, received, and filed during the year.

## DISTRIBUTION OF PUBLICATIONS

During the fiscal year ending March 31, 1929, the distribution of Mines Branch reports, bulletins, memorandum series, press bulletins, maps, lists of mine operators, etc., amounted to 45,680 copies.

## LIBRARY

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

## Accessions to the library, 1928:

Books (by purchase).....	318
Books (by gift).....	36
Books (by transfer from other Government libraries).....	244
Books (complete unbound volumes).....	270
Books added to the circulating division of library.....	122
Canadian Government documents (by exchange and gift).....	1,722
British and foreign Government documents (by exchange and gift).....	892
Scientific societies, bulletins, proceedings, and transactions (by exchange and gift).....	1,311
Pamphlets (by gift).....	42
Pamphlets (by transfer from other Government libraries).....	102
Trades catalogues (by gift).....	116

During the year 342 books were bound.

Accessions to the library were appreciably increased by transfers from other Government libraries. Approximately seven hundred pamphlets were received in this way, which were subsequently passed along to other libraries.

Requests for reports and monographs issued by the Mines Branch and now out of print have been more frequent during 1928 than for any other year, and much time has been given to supplying inquirers through the circulation division of the library, which was inaugurated in 1926 to meet this emergency.

Further progress has been made toward the general readjustment of the library, which was undertaken late in 1927.

## EXPLOSIVES DIVISION

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

### *Explosives Factories*

Two new factories were licensed during the year under review. The Mexco Company opened a factory near Parry Sound, Ontario, following on the closing of the one at Swastika, Ontario, and the Macdonald Metal Products Company established a factory for the making of caps for toy pistols in conjunction with their workshops at Waterloo, Quebec. This special section was licensed on January 1, 1929.

The production of explosives in 1928 showed an increase of approximately 15 per cent above that in 1927.

No accident involving loss of life or serious injury occurred during the year ending March 31, 1929. A rapid chemical reaction and explosion in the conduct of certain experimental work in a factory laboratory caused an outbreak of fire that destroyed the building, and by which a chemist sustained minor injuries. A glaze mill in the factory of the Canadian Explosives, Limited, at Beloeil, Quebec, was struck by lightning, and its contents, amounting to about 8,700 pounds of sporting and fuse powders, were exploded. The power had been shut off and employees cleared from the building when the storm developed. An employee in another building was slightly burned with acid, owing to the breaking of a glass tube by the explosion. The glaze mill was completely destroyed, but the barricades around it, although themselves practically razed to the ground, sufficed to save other factory buildings from damage, except of a minor character.

A soda dry house, in the factory at James Island, B.C., was destroyed by fire. It arose from the outlet plug of a car, containing molten nitre-cake, being jarred loose when the car was passing over points, near the soda house, and the molten nitre cake coming in contact with the wooden floor of the soda house.

At the same factory a charge of 500 pounds of black powder mixing, in a wheel mill, exploded on the mill being started. The employees being under cover when a mill is running, no one was injured. The cause was not definitely ascertained, but it is probable that friction set up by a sliding action of the wheel, on starting, contributed to the ignition.

### *Magazines*

There were 282 magazines under licence on March 31, 1929, and licences for 190 temporary magazines had been granted during the year.

Reports were received of eight magazines being forcibly entered. From one, 21 cases of dynamite were stolen. The losses from the others were small, totalling 500 pounds of explosives and 200 detonators. With the exception of one, which was of temporary character and light construction, all were strongly built magazines. At the same time it is to be remembered that magazines must be in more or less isolated locations.

### *Explosives Condemned*

Explosives amounting to 1,500 pounds and 3,000 detonators, distributed over 19 magazines, were condemned on inspection and destroyed.

In addition, 500 pounds of dynamite, abandoned in the bush, were traced by the Royal Canadian Mounted Police, who also located several small quantities of dynamite and detonators left in various parts of the country. These abandoned explosives were destroyed.

### *Prosecutions*

Prosecutions were made and convictions obtained in nine cases. Two of these were on charges of keeping explosives in licensed magazines in excess of the quantity prescribed by the licence. Two arose from violation of the regulations regarding the conveyance of explosives, and five related to the keeping of explosives in unlicensed premises. A further case, in this last category, was heard and decision is awaited.

In addition to these a case against a person for the unlawful keeping of explosives in a quarry—not in operation—was dismissed by the magistrate, and is the subject of appeal.

In another case a charge of unlawful keeping of explosives was dismissed.

### *Importations*

A total of 654 permits for importation and 42 special permits, were issued during the year. The rejections of Chinese fireworks continued to be heavy for the first few months, but since then have been very few—owing partly to an evident care being taken by the Chinese exporters to ship only authorized fireworks to Canada, also to the co-operation given by wholesale dealers in the United States in their preliminary examination of Chinese shipments *before forwarding* supplies to Canadian dealers. A particularly useful service has been rendered by the Royal Canadian Mounted Police and the analyst of the Department of Health, at Vancouver, in conducting the examination of shipments in co-operation with the Customs officers.

### *Authorization of Explosives*

Five new explosives were submitted for examination, one authorized and four rejected. Of manufactured fireworks 115 varieties presented were authorized and 144 rejected.

### *Accidents*

Accidents, with explosives, which occurred during the year 1928, have been classified according to their circumstances and probable causes, and are given in the annual report for the division. Those occurring in the use of explosives, and under other circumstances not directly controlled by the Act, were responsible for the death of 64 persons and injury to 192 others. This is a marked increase on the list for the preceding year, and, allowing for the increase in quantity of explosives used, is just proportional to the losses sustained during the five year period prior to 1928. Included in the above are accidents caused by playing with explosives which resulted in the death of 7 persons and injury to 80. The victims were almost all young lads or children and the casualties were very nearly equally divided between "playing with detonators" and "playing with other explosives".

In a constant effort to combat this the enforcement of the regulations relating to the safe keeping of explosives is supplemented by the instructions and warnings given by school teachers, by the Royal Canadian Mounted Police, and by the activities, notably in the province of Quebec, of the Safety League.

### *General*

In carrying out the inspections of licensed magazines, valuable assistance has been given by deputy inspectors of explosives of the Royal Canadian Mounted Police, without whose aid it would not be practicable adequately to cover the ground. In the wider field of inspections of unlicensed premises 2,500 inspections were made by these deputy inspectors and 700 by inspectors of the division. In but very few cases has it been found necessary to have recourse to prosecution to enforce compliance with the regulations, explanation of the purpose of the regulations and of their requirements generally having the desired effect.



## EDITORIAL DIVISION

F. Nicolas, *Editor-in-Chief*

During the fiscal year forty-one separate English publications were issued by the Department, consisting of annual reports, memoirs, bulletins, and pamphlets; there were issued also ten lists of mine operators and mines. Six reports and fourteen pamphlets were published in French.

At the end of the fiscal year there were in the hands of the King's Printer seven English reports and one French translation of the Geological Survey, nine English reports and one French translation of the National Museum, two English reports and one French translation 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 distributed<sup>1</sup> during that period:

## DEPARTMENT OF MINES

*English Publications*Report  
No.

2132. *Report of the Department of Mines for the Fiscal Year ending March 31, 1928*: 65 pages; 1 plate; 1 figure; 3,000 copies; published March 18, 1929.  
*The Mineral Industries of Canada Reach from Coast to Coast* (Second advertisement pamphlet relating to the Department of Mines): 15 pages; 13 plates; 3 figures; 2,800 copies; published November 16, 1928.

*French Translations*

- Liste des Publications françaises du Ministère des Mines*: 6 pages; 800 copies; published September 5, 1928.

## GEOLOGICAL SURVEY

*English Publications*

2128. *Economic Geology Series 5. Oil and Gas in Western Canada*—by G. S. Hume: 152 pages; 14 figures; 2,500 copies; published September 14, 1928.  
 2132. *Memoir 154. Geological Series 135. Geology of Anticosti Island*—by W. H. Twenhofel: 481 pages; 60 plates; 1 figure; 1,600 copies; published August 30, 1928.  
 2140. *Bulletin 40. Geological Series 48. Contributions to Canadian Palæontology*—by A. Wetmore, F. A. Batler, A. F. Foerste, E. M. Kindle, F. H. McLearn, and W. A. Ball: 67 pages; 18 plates; 3 figures; 1,500 copies; published July 16, 1928.  
 2162. *Summary Report of the Geological Survey, Department of Mines, for the Calendar Year 1927, Part A*: 65 pages; 6 figures; 2 maps; 3,000 copies; published February 4, 1929.  
 2171. *Summary Report of the Geological Survey, Department of Mines, for the Calendar Year 1927, Part C*: 124 pages; 2 plates; 4 maps, 3,000 copies; published January 19, 1929.  
 Separate: *Geology of North Mountain, Cape Breton*—by T. D. Guernsey: 36 pages; 1 map; 200 copies; published February, 1929.

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

Report  
No.

2172. *Summary Report of the Geological Survey, Department of Mines, for the Calendar Year 1927, Part B*: 94 pages; 4 figures; 2 maps; 3,000 copies; published January 30, 1929.  
 Separate: *Oil Prospects near Bragg Creek, Alberta*—by G. S. Hume: 20 pages; 3 figures; 500 copies; published June 11, 1928.  
*List of Publications of the Geological Survey and National Museum*: 15 pages; 1,000 copies; published December 31, 1928.

### French Translations

2147. *Mémoire 152. Série géologique 133. La région de Saint-Urbain, district de Charlevoix, Québec*—by J. B. Mawdsley: 64 pages; 2 plates; 9 figures; 1 map; 1,000 copies; published September 24, 1928.  
 2163. *Rapport sommaire de la Commission géologique, Ministère des Mines, pour l'année civile 1926, Partie C (extraits)*: 71 pages; 9 figures; 1,250 copies; published March 30, 1929.

### NATIONAL MUSEUM OF CANADA

- Report of the Canadian Arctic Expedition 1913-18<sup>1</sup>: Volume IV: *Botany, Part B: Marine Algae*: 31 pages; 2 plates; 4,500 copies; published April 10, 1928.  
 Report of the Canadian Arctic Expedition 1913-18<sup>1</sup>: Volume XV: *Eskimo Language and Technology, Part A: Comparative Vocabulary of the Western Eskimo Dialects*—by D. Jenness: 134 pages; 5,000 copies; published January 18, 1929.  
 Bulletin 41. Biological Series 10. *Birds of Western Canada*—by P. A. Taverner. Second Edition (revised): 379 pages; 84 plates; 315 figures; 10,000 copies; published December 15, 1928.  
 Bulletin 50. *Annual Report for 1926*: 126 pages; 19 plates; 1 figure; 3,500 copies; published October 20, 1928.  
 Separate: *The National Museum of Canada*—by W. H. Collins: 39 pages; 10 plates; 1 figure; 1,000 copies; published February 28, 1929.  
 Separate: *Archaeological Investigations in Bering Strait*—by D. Jenness: 10 pages; 3 plates; 100 copies; published October 22, 1928.  
 Separate: *Restoration of Totem-Poles in British Columbia*—by H. I. Smith: 3 pages; 100 copies; published October 26, 1928.  
 Separate: *Commercial Bent Grasses (Agrostis) in Eastern Canada*—by M. O. Malte: 22 pages; 6 plates; 300 copies; published November 25, 1928.  
 Bulletin 51. Anthropological Series 10. *Uren Prehistoric Village Site, Oxford County, Ontario*—by W. J. Wintemberg: 97 pages; 23 plates; 3 figures; 1,000 copies; published November 27, 1928.  
 Bulletin 52. Biological Series 14. *The Lepturini of America North of Mexico, Part I*—by J. M. Swaine and Ralph Hopping: 97 pages; 13 plates; 1,000 copies; published October 26, 1928.

### MINES BRANCH

#### English Publications

686. *Silica in Canada: Its Occurrence, Exploitation, and Uses, Part II—Western Canada*—by L. Heber Cole: 59 pages; 6 plates; 7 figures; 4,000 copies; published May 25, 1928.  
 687. *Investigations of Mineral Resources and the Mining Industry, 1926*: 80 pages; 7 plates; 6 figures; 4,000 copies; published September 28, 1928.  
 688. *Investigations in Ore Dressing and Metallurgy, 1926*: 134 pages; 5 plates; 4,000 copies; published September 10, 1928.

Report  
No.

689. *Investigations of Fuels and Fuel Testing, 1926*: 132 pages; 7 plates; 16 figures; 4,000 copies; published September 25, 1928.  
 Separate: Part I—*Solid Fuels*: 87 pages; 3 plates; 10 figures; 500 copies; published September 12, 1928.  
 Separate: Part II—*Liquid Fuels*: 47 pages; 4 plates; 6 figures; 500 copies; published September 12, 1928.

<sup>1</sup>The Arctic reports were published under the supervision of R. M. Anderson, Chief, Biological Division, National Museum of Canada, as general editor of the Arctic Publications Committee.

Report  
No.

690. *Investigations in Ceramics and Road Materials, 1926*: 70 pages; 1 figure; 4,000 copies; published July 20, 1928.
691. *Diatomite: Its Occurrence, Preparation, and Uses*—by V. L. Eardley-Wilmot: 182 pages; 15 plates; 31 figures; 1 map; 4,000 copies; published December 11, 1928.
694. *Investigations of Mineral Resources and the Mining Industry, 1927*: 60 pages; 11 plates; 7 figures; 4,000 copies; published March 1, 1929.
- Price List of Mines Branch Publications*: 10 pages; 1,000 copies; published March 1, 1929.
- Peat Fuel Circular*: 1 page; 5,000 copies; published August 22, 1928.
- Peat Fuel Poster*: 1 page; 1,000 copies; published August 25, 1928.
- Peat Fuel Folder. Directions for Domestic Use of Peat Fuel*: 3 pages; 5,000 copies; published August 24, 1928.
- Reprint: 10,000 copies; published February 22, 1929.

*Lists of Mines and Mine Operators in Canada:*

- Milling Plants: 1,000 copies; published June 14, 1928.
- Metallurgical Works: 1,000 copies; published June 15, 1928.
- Iron: 1,000 copies; published July 3, 1928.
- Molybdenum, Antimony, and Tungsten: 1,000 copies; published July 3, 1928.
- Copper and Nickel-Copper: 1,000 copies; published July 13, 1928.
- Silver-Lead-Zinc: 1,000 copies; published August 28, 1928.
- Silver: 500 copies; published September 6, 1928.
- Natural Gas and Petroleum Wells: 1,500 copies; published September 12, 1928.
- Gold: 1,000 copies; published September 14, 1928.
- Mineral Pigments: 1,000 copies; published February 22, 1929.

*French Translations*Report  
No.

683. *Rapport préliminaire sur les calcaires des provinces de Québec et d'Ontario*—by M. F. Gouge: 81 pages; 16 plates; 3 figures; 1,250 copies; published March 30, 1929.
- Tourbe Combustible (Circular)*: 1 page; 5,000 copies; published September 1, 1928.
- Tourbe Combustible (Poster)*: 1 page; 1,000 copies; published September 1, 1928.
- Directions pour l'usage de ménage de la tourbe combustible*: 3 pages; 5,000 copies; published September 10, 1928.
- Reprint: 10,000 copies; published February 22, 1929.

## DOMINION FUEL BOARD

*English Publications*

1. *Interim Report of the Dominion Fuel Board 1923* (Second edition): 31 pages; 4 figures; 4 maps; 1,000 copies; published August 28, 1928.
10. *Second Progress Report of the Dominion Fuel Board 1923-1928*: 57 pages; 5 plates; 1 figure; 1 map; 25,000 copies; published December 31, 1928.
- Changes in the Fuel Situation in Canada*—by Charles Cammell: 3 pages; 1,000 copies; published December 6, 1928.

*French Translations*

9. *Avantages qu'offrirait l'isolation thermique de votre maison* (Second edition): 16 pages; 7 drawings; 5,000 copies; published August 1, 1928.
- La tourbe combustible est maintenant fabriquée à Alfred* (for Natural Resources Intelligence Service, Department of the Interior): 3 pages; 25 typewritten copies; published September 25, 1928.
- Suggestions sur la manière de brûler la tourbe* (for Natural Resources Intelligence Service, Department of the Interior): 3 pages; 18 typewritten copies; published October 10, 1928.

## EXPLOSIVES DIVISION

*English Publications*Report  
No.

23. *Annual Report of the Explosives Division for the Calendar Year 1927*: 23 pages; 2,000 copies; published June 15, 1928.  
Reprint: *Beware of Explosives*: 3 pages; 20,000 copies; published December 1, 1928.  
*Order in Council No. 472 with Subsequent Amendments*: 4 pages; 4,000 copies; published February 4, 1929.

*French Translations*

24. *Rapport annuel de la Division des Explosifs pour l'année civile 1927*: 22 pages; 1,000 copies; published September 14, 1928.  
Reprint: *Méfiez-vous des Explosifs*: 3 pages; 5,000 copies; published December 1, 1928.  
*Arrêtés du Conseil nos 361-363, 469, 470, 482, 2601, 2602*: 1,000 copies of each; published February 4, 1929.  
*Arrêté du Conseil n° 472*: 4,000 copies; published February 4, 1929.

## 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. During the fiscal year 1928-29, 16,199 copies were distributed in Canada and foreign countries, as follows: 3,241 to addresses on the mailing lists, through the Printing Bureau Distribution Office; 3,868 copies in compliance with written or personal requests, distributed from our distribution office; and approximately 9,000 copies of a revised edition of the pamphlet on "Instructions for Burning Coal, Coke, and Peat" to coal dealers. This distribution does not include, however, the publications sent out by the Dominion Fuel Board and the Explosives Division.

## ACCOUNTING DIVISION

## ACCOUNTANT'S STATEMENT

P. R. Marshall

The funds available for the work and the expenditure of the Department of Mines for the fiscal year ending March 31, 1929, were:

	Grant	Expenditure	
		Amount	Total
	\$ cts.	\$ cts.	\$ cts.
<b>DEPARTMENT—</b>			
Amount voted by Parliament.....	112,074 00		
Civil Government salaries.....		73,493 53	
Grant to Imperial Institute.....		12,848 00	
Expenses of Explosives Division.....		11,999 99	
Civil Government contingencies.....		6,416 85	
Grant to Canadian Institute of Mining and Metallurgy.....		3,000 00	107,758 42
Balance unexpended and lapsed.....			4,315 58
<b>GEOLOGICAL SURVEY—</b>			
Amount voted by Parliament.....	658,045 00		
Civil Government salaries.....		304,043 54	
Explorations, surveys, and investigations.....		177,665 32	
Wages.....		55,152 81	
Publication of reports and maps.....		40,936 71	
Sundry printing and stationery.....		19,011 59	
Museum equipment.....		14,610 35	
Miscellaneous.....		4,805 49	
Instruments and repairs.....		2,837 22	
Specimens for Museum.....		2,299 09	
Petrographic laboratory.....		2,063 44	
Photographic supplies.....		1,379 35	
Miscellaneous gratuity.....		230 00	
Balance unexpended and lapsed.....			634,034 91
			24,010 09
<b>MINES BRANCH—</b>			
Amount voted by Parliament.....	654,460 00		
Civil Government salaries.....		193,366 50	
Expenses of fuel testing plant and laboratory.....		76,109 33	
Expenses of ore dressing and metallurgical laboratories.....		49,287 97	
Operation of peat plant, Alfred, Ont.....		45,024 12	
Printing and stationery.....		34,919 45	
Expenses of Dominion Fuel Board.....		23,692 81	
Subvention on Canadian coals.....		23,318 27	
Investigation of mineral resources and deposits.\$23,583 06			
Less advances 1927-28..... 1,300 00			
		22,283 06	
Chemical laboratories.....		18,066 33	
Wages.....		14,593 31	
Miscellaneous.....		3,712 98	
Transportation charges on ore shipments.....		637 50	
Compensation to J. H. Fortune.....		400 00	
Advances to be accounted for in 1929-30.....		1,622 44	
Balance unexpended and lapsed.....			507,034 07
			147,425 93
<b>DOMINION OF CANADA ASSAY OFFICE—</b>			
Amount voted by Parliament.....	27,140 00		
Earnings.....	58 75		
Salaries of staff.....		20,625 00	
Assayers' supplies.....		1,633 55	
Miscellaneous.....		727 52	
Electric burglar alarm service.....		360 00	
Premium on bonds.....		462 50	
Balance unexpended and lapsed.....			23,808 57
			3,390 18
	1,451,777 75		1,451,777 75

## Summary

	Grant		Expenditure		Grant not used	
	\$	cts.	\$	cts.	\$	cts.
Civil Government salaries.....	612,400	00	570,903	62	41,496	38
Department.....	34,549	00	34,264	84	284	16
Geological Survey.....	331,000	00	329,761	37	1,238	63
Mines Branch.....	446,400	00	313,667	57	132,732	43
Dominion of Canada Assay Office, Vancouver, B.C.....	\$ 27,140	00				
Earnings.....	58	75				
	27,198	75	23,808	57	3,390	18
Miscellaneous gratuities.....	230	00	230	00		
	1,451,777	75	1,272,635	97	179,141	78

## Casual Revenue

Sales of equipment, explosive permits, publications, etc.....	\$ 2,149	24
Sales of peat.....		1,654 96
Gold bullion recovered from residue.....	\$ 502	54
Less loss on gold bullion.....	282	26
Fines for violation of Explosives Act.....		75 00
Miscellaneous.....		158 05
	\$ 4,257	53



## INDEX

	PAGE		PAGE
Accidents due to explosives.....	49	Draughting division.....	
Accounting division.....	54	Geological Survey.....	22-25
Addresses and papers published, list of.	6-8	Mines Branch.....	46
Alberta, borings.....	21	Duff, Flint, and Company.....	20
Field work.....	11, 15	Eardley-Wilmot, V. L.....	36
Alcock, F. J.....	14	Editorial division.....	50
Amory, Copley.....	32	Educational collections.....	18
Anderson, A. K.....	38	Ells, S. C.....	36
Anderson, R. M.....	31-33	Ellsworth, H. V.....	17, 18
Anthracite. <i>See</i> Dominion Fuel Board		Ethnology.....	29
Anthropological division.....	29	Evans, C. S.....	9, 11
Archæology.....	29	Expenditure. <i>See</i> Accounting division	
Assay office, Vancouver, B.C.....	45, 54	Explosives division.....	48
Baine, H. E.....	46	Fabry, R. J. C.....	18
Baltzer, C. E.....	40	Faribault, E. R.....	14
Bannerman, H. M.....	13	Field work.....	1, 9
Barbeau, C. M.....	29, 30	Archæology.....	29
Bartlett, R.....	15	Biology.....	31
Bell, W. A.....	19	Ceramics.....	42
Biological division.....	31	Ethnology.....	29
Blakely, D.....	32	Geology.....	9
Borings division.....	20	Mineralogy.....	17
Bostock, H. S.....	10	Mines Branch.....	36
Bowby, J. L.....	39	Palæontology.....	19
Boyd, W. H.....	15	Topography.....	15
British Columbia, borings.....	21	Forsey, Mrs. F. E.....	27
Field work.....	10, 15	Fossils. <i>See</i> Palæontological division	
Office.....	28	Fraser, F. J.....	22
Brownell, G. M.....	13	Fréchette, H.....	42, 43
Buisson, Arthur.....	37	Freeman, C. H.....	37
Burroughs, E. J.....	40	French publications.....	50-53
Butterworth, J. V.....	16	Fritz, M. A.....	20
Cairnes, C. E.....	10	Fuel Board.....	4
Camsell, Charles.....	1-5	Fuel Testing division.....	39
Canada, mineral production.....	3	Gas, natural. <i>See</i> Borings division	
Carnochan, R. K.....	38, 39	Geological division.....	9
Casey, J. M.....	37	Geological Information and Distribution	
Ceramics division.....	42	division.....	26
Chantler, H. McD.....	39, 41	Geological Survey, accounts.....	54, 55
Chemistry division.....	44	Reports.....	9-28
Chipman, K. G.....	16	Gilchrist, L.....	14
Clark, T. H.....	14	Gilmore, R. E.....	40
Clarke, G. G.....	26	Godard, J. S.....	38
Coal. <i>See</i> Dominion Fuel Board		Goudge, M. F.....	36
Cockfield, W. E.....	9	Grant, J. C. Boileau.....	30
Cole, L. H.....	36	Gunning, H. C.....	10, 11
Collin, L. P.....	43	Haanel, B. F.....	34, 39, 40
Collins, W. H.....	9, 12, 29	Hanson, G.....	10
Connell, G. P.....	41	Hardy, T. W.....	38
Cooke, H. C.....	13	Harkness, R. B.....	20, 21
Cushman, J. A.....	22	Harrold, C. G.....	32
Davis, N. F. G.....	10	Haultain, A. G.....	16
Deputy Minister. <i>See</i> Camsell, Charles		Henderson, J. A. L.....	21
Dickison, A.....	22	Indians. <i>See</i> Anthropological division	
Directors' report. <i>See</i>		Ingall, E. D.....	9
Camsell, Charles		Jenness, D.....	29, 30
Collins, W. H		Johnson, Claude E.....	32
McIeish, J.		Johnston, J. D.....	39
Distribution division.....	26, 47	Johnston, W. A.....	12
Dolmage, Victor.....	10, 28	Jones, I. W.....	14
Dominion Fuel Board.....	4		



	PAGE		PAGE
Jones, W. A.....	12, 13	Patch, C. L.....	29, 32
Kerr, F. A.....	10, 28	Peat .....	2, 42
Kindle, Cecil.....	19	Phemister, T. C.....	10
Kindle, E. M.....	19	Phillips, J. G.....	42, 43
Kirk, S. R.....	12	Photographic division.....	26
Laing, H. M.....	32	Picher, R. H.....	44
Lectures in Museum .....	29	Poitevin, Eugene.....	17
Leverin, H. A.....	44	Prairie Provinces, borings.....	21
Library, Geological Survey.....	27	Prince Edward Island.....	21
Mines Branch .....	47	Publications, list of.....	6-8, 50-53
Mabee, H. C.....	39	Quebec, field work.....	13, 16
McClelland, W. R.....	39	Quirke, T. T.....	13
Macdonald, J. A.....	16	Raup, H. M.....	32
McDonald, R. C.....	15	Road Materials division.....	42
McGerrigle, H. W.....	14	Robinson, A. H. A.....	36
Mackay, B. R.....	11	Rochon, J.....	32
McKinnon, A. T.....	17	Rogers, R. A.....	39
McLean, S. C.....	15, 16	Rosewarne, P. V.....	41
McLearn, F. H.....	11, 19	Ross, C. C.....	20
McLeish, J.....	34	Ross, J. G.....	37
McMahon, J. F.....	44	Ross, S. H.....	13
Maddox, D. C.....	20, 22	Sadler, A.....	44
Malcolm, Wyatt .....	26	Salaries. See Accounting division	
Malloch, E. S.....	40	Saskatchewan, field work.....	11
Malte, M. O.....	27, 32, 33	Senécal, C.-Omer .....	22
Manitoba, field work.....	12, 15	Sheppard, A. C. T.....	15
Mantle, A. W.....	42	Smith, Harlan I.....	29-31
Maps. See Draughting division		Soper, J. D.....	32
Geographical division		Spence, H. N.....	16
Marshall, J. R.....	10	Spence, H. S.....	36
Marshall, P. R.....	54	Spence, J. W.....	16
Mawdsley, J. B.....	13	Squires, H. D.....	13
Miller, W. H.....	15	Steeves, S. M.....	15
Mineralogical division.....	17	Stewart, M. C.....	29
Mineral Resources division.....	35	Sternberg, C. M.....	19
Mines Branch, accounts .....	54	Stockwell, C. H.....	11
Reports .....	34-47	Strong, R. A.....	40
Mohr, C. B.....	41	Swartsman, E.....	39
Moore, E. V.....	42	Swinnerton, A. A.....	41
Moran, J.....	45	Tanton, T. L.....	12
Museum. See National Museum of		Taverner, P. A.....	32, 33
Canada .....	18, 29, 31, 33	Thompson, E. A.....	44
Ness, John.....	21	Thomson, Robert .....	12, 13
Nettel, A. J. C.....	28	Timm, W. B.....	34, 37-39
New Brunswick, borings.....	21	Topographical division .....	15
Field work .....	14, 16	Trail, R. J.....	39
Nichols, D. A.....	15, 17	Turner, H. A.....	32
Nicolas, F.....	50	Tuttle, A. C.....	9, 15
Nicolls, J. H. H.....	41	Vancouver, Assay office.....	45, 55
Nordegg, Martin.....	31	Wait, E. H.....	37
Norman, G. W. H.....	15	Wait, F. G.....	44
Northrop, S. A.....	14	Walker, J. F.....	11
Nova Scotia, borings.....	21	Warren, P. S.....	11
Coal shipments.....	14	Wickenden, R. T. D.....	22
Field work .....	14, 16	Wight, J. E. F.....	33
O'Brian, C. L.....	45	Wilcox, C. E.....	33
Offord, R. J.....	41	Wilmot, V. L. See Eardley-Wilmot,	
Ogilvie, Lt.-Col. G.....	48	V. L.....	
Ogilvie, Mrs. O. P. R.....	47	Wilson, A. E.....	19
Ontario, borings .....	21	Wilson, A. W. G.....	35
Field work .....	12	Wilson, M. E.....	13, 29
Ore Dressing division.....	37	Wintenberg, W. J.....	29-31
Organization chart .....	vi	Wright, J. F.....	12
Osgood, C. B.....	30	Young, G. A.....	9
Paleontological division.....	19	Young, R. J.....	45
Papers and addresses published, list of	6-8	Yukon, field work.....	9
Parsons, C. S.....	39		

