DOMINION OF CANADA

REPORT

OF THE

DEPARTMENT OF MINES

FOR THE

FISCAL YEAR ENDING MARCH 31, 1925

OTTAWA
F. A. ACLAND
PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
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To General His Excellency the Right Honourable Lord Byng, of Vimy, G.C.B., G.C.M.G., M.V.O., 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, 1925.

CHARLES STEWART,
Minister of Mines.

CONTENTS

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OF THE

DEPARTMENT OF MINES

FOR THE FISCAL YEAR ENDING MARCH 31, 1925

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

Sir,—I have the honour to submit the Annual Report of the Department of Mines for the year ending March 31, 1925.

Summarized statements from the heads of branches are included which cover the administration and activities of these branches. These indicate that satisfactory progress has been made during the year in carrying out the functions assigned to the department by Parliament. In all branches, however, there has been difficulty in meeting the ever-growing demands of the public for increased services and investigation in the field and laboratory. The urgent necessity for economy has compelled the department to restrict its activities to such problems as are most pressing and which give promise of yielding the largest returns for the money expended. In the Geological Survey a larger number of field parties might have been employed on geological mapping of mineral-bearing formations and general exploratory work. In the Mines Branch many more problems in mineral technology and fuel research present themselves than our appropriation and staff permit us to handle. The position of the Museum has been referred to in previous reports and although it is recognized that the building up of a National Museum that will adequately represent the Dominion as a whole is an ideal that must ultimately be attained, it is necessary to report that for various reasons little progress has been made during the year in attainment of that ideal.

The system inaugurated last year of dispatching to the High Commissioner's office in London periodical news-letters on mineral resources and mining development in Canada has been continued. Numerous expressions of appreciation have been received from the recipients of this service and its continuance is, therefore, proposed.

In conformity with this system it is becoming more and more the practice of the department to disseminate information on Canadian natural resources by means of addresses and through the medium of the technical journals, the radio, and the public press, as well as by the regular publications of the department. In this work the department has, as before, received the willing co-operation of the Natural Resources Intelligence Branch of the Interior Department. The extent to which this information is disseminated is shown by the list of papers and addresses which follow:

List of Papers and Addresses

Canada's Mineral Industry, by Charles Camsell. Canadian Club, Montreal.
The Department of Mines; Its Organization, Duties, Equipment, and Publicity Work, by L. L. Bolton, R.C.A.F. Officers' Training Course, Camp Borden.
Across Gaspe, by F. J. Alcock. Geographical Review, April, 1924.
The Pas Mineral Belt, by F. J. Alcock. Canadian Mining Journal, July 25, 1924.
The Mineral Deposits of Gaspe, by F. J. Alcock. Canadian Mining Journal, October 10, 1924.
The Subdivision of the Carboniferous Rocks of the Maritime Provinces, by W. A. Bell. Transactions Canadian Institute Mining and Metallurgy, vol. 27, and Canadian Mining Journal, November 21, 1924.
Topographic Surveying by the Geological Survey, Canada, by W. H. Boyd. Canadian Mining Journal, July 4, 1924.
An Occurrence of Nickel Ore in Yale Mining District, B.C., by C. E. Cairnes. Canadian Mining Journal, November 28, 1924.
The Mayo Silver-lead District, Yukon, by W. E. Cockfield. Canadian Mining Journal, September 12, 1924.
Mining Activities in the Yukon, by W. E. Cockfield. Canadian Mining Journal, January 2, 1925.
Yukon Silver-lead: The Silver-Lead Deposits of Beaver River District, Yukon, by W. E. Cockfield. Canadian Mining Journal, January 16, 1925.
The Geology and Physical Geography of Canada, by W. H. Collins. Handbook of Canada, published by the British Association for the Advancement of Science, Ninety-second Annual Meeting at Toronto, 1924, pp. 346-374.
The Work of the Geological Survey in British Columbia, by V. Dolmage. Canadian Mining Journal, February 29, 1924.
Prospecting, by V. Dolmage. Canadian Mining Journal, April 25, 1924.
Western Mineral Belt of British Columbia, by V. Dolmage. Canadian Mining Journal, June 27, 1924.
The B. C. Silver Mine, by V. Dolmage. Canadian Mining Journal, July 25, 1924.
Blue Corundum of the Bancroft Area, by H. V. Ellsworth. Canadian Mining Journal, October 10, 1924.
The Rare Element Minerals of Canada, by H. V. Ellsworth. Chemistry and Metallurgy, vol. VIII, November, 1924.
Radioactive Minerals as Geological Age Indicators, by H. V. Ellsworth. American Journal of Science, vol. 9, February, 1925.
Canadian Pegmatites and Their Minerals, by H. V. Ellsworth. Canadian Mining Journal, February 27, 1925.
Duration of Pre-Cambrian Time, by H. V. Ellsworth. Pan-American Geologist, March, 1925.
Oil Developments and Prospects in Canada, 1924, by G. S. Hume. Bulletin Canadian Institute of Mining and Metallurgy, February, 1925.
The Wainwright-Irma Oil and Gas Area, Alberta, by G. S. Hume. Canadian Mining Journal, December 26, 1924.
The Clericy and Kinojevis Map Areas, Quebec, by W. F. James and J. B. Mawdsley. Canadian Mining Journal, March 6, 1925.
Placer Mining Developments in Cariboo, by W. A. Johnston. Canadian Mining Journal, December 26, 1924.
Cedar Creek Placers; the New Mining Plant and Mining Conditions at Cedar Creek, Cariboo District, B.C., by W. A. Johnston. Canadian Mining Journal, January 30, 1925.
History of Gold Dredging in Fraser River, British Columbia, and Future Possibilities, by W. A. Johnston. Canadian Mining Journal, February 27, 1925.
Notes on Cassiar: The Prospective Gold Rush in Cassiar, B.C., by W. A. Johnston. Canadian Mining Journal, March 27, 1925.
Observations on Ice-Borne Sediments by the Canadian and Other Arctic Expeditions, by E. M. Kindle. American Journal Science, vol. VII, 1924.
Standard Palæozoic Section of Rocky Mountains near Banff, Alta., by E. M. Kindle. Pan-American Geologist, vol. XLII, 1924.
An Ottawa Sea Beach of Long Ago, by E. M. Kindle. Onward, May 31, 1924.
Note on a Mammoth Tusk from the Arctic Archipelago, by E. M. Kindle. American Journal of Science, vol. VIII, 1924.
Three New Devonian Fossils from Alberta, by E. M. Kindle. Pan-American Geologist, vol. XLII, 1924.

Studies in Sedimentation in Canadian Colleges and Universities, by E. M. Kindle. Rept. Committee on Sedimentation for 1924, U.S. National Research Council, Washington.
The Labrador Environment, by E. M. Kindle. Canadian Magazine, December, 1924.
Museum Guides (Review), by E. M. Kindle. Canadian Field Naturalist, vol. 39.
A New Museum Exhibit (Exhibition of coal and coal products at Victoria Museum, Ottawa), by B. R. MacKay. Canadian Mining Journal, February 20, 1925.
Mineral Industry of Canada, by W. Malcolm. Handbook of Canada, published by the British Association for the Advancement of Science, Ninety-second Annual Meeting at Toronto, 1924, pp. 384-396.
Mineral Industry of Canada, Factors in Its Development, by W. Malcolm. The Globe, Toronto, Ont., April, 1924.
Canada's Mineral Industry (Commercial and Financial Review of the year 1924), by W. Malcolm. The Gazette, Montreal.
Mineral Industry, by W. Malcolm. Canadian Mining Journal, January 23, 1925.
New Pelecypods from the Fernie Formation of the Alberta Jurassic, by F. H. McLearn. Transactions of Royal Society of Canada, Section IV, 1924.
A New Occurrence of Lansfordite from Atlin, B.C., by E. Poitevin. American Mineralogist, November, 1924.
Mineralogy at Ottawa, by E. Poitevin. Canadian Mining Journal, February 27, 1925.
New Optical Data for Analysed Sussexite, by E. Poitevin and H. V. Ellsworth. American Mineralogist, September, 1924.
Notes on the Lance Formation of Southern Saskatchewan, by C. M. Sternberg. Canadian Field Naturalist, No. 4, 1924.
A New Genus and a New Species of Gastropod from the Upper Ordovician of British Columbia, by A. E. Wilson. Canadian Field Naturalist, vol. 38, No. 8.
The Grenville Pre-Cambrian Sub-province, by M. E. Wilson. Report of British Association for the Advancement of Science, Toronto, 1924.
Wabigoon and Traplake Soapstone Deposits, Ontario, by J. F. Wright. Canadian Mining Journal, September 5, 1924.
Some Geological Notes on the East Central Manitoba (Rice Lake) Gold Area, by J. F Wright. Canadian Mining Journal, January 16, 1925.
Oiseau and Maskwa Copper and Copper-nickel Deposits, Southeastern Manitoba, by J. F. Wright. Bulletin Canadian Institute Mining and Metallurgy, March, 1925.
Occurrence of Nickel Ore, Yale, B.C., by C. E. Cairnes. High Commissioner, London.
Placer Mining in Cariboo, B.C., by W. A. Johnston. High Commissioner, London.
The Mining Situation in British Columbia, by V. Dolmage. High Commissioner, London.
Conditions in Northwestern Quebec, by W. F. James. High Commissioner, London.
Iron Ore Possibilities, Thunder Bay District, by T. L. Tanton. High Commissioner, London.
Recent Developments in the Mayo District, by W. E. Cockfield. High Commissioner, London.
Recent Developments in Skeena River District, by Geo. Hanson. High Commissioner, London.
Recent Developments in Southeastern Manitoba, by J. F. Wright. High Commissioner, London.
Radioactive Minerals in Canada, by H. V. Ellsworth. High Commissioner, London.
The Oil Fields at Wainwright, Alberta, by G. S. Hume. High Commissioner, London.
The Earth and the Fullness Thereof, by A. E. Wilson. Radio Broadcast.
Ten Summers in the Yukon, by W. E. Cockfield. Radio Broadcast.
Sight-seeing Along the Canadian National Railways in British Columbia, by J. R. Marshall. Radio Broadcast.
Fishing and Hunting in the Gaspe Peninsula, Quebec, by F. J. Alcock. Radio Broadcast.
Prospecting in Manitoba, by J. F. Wright. Radio Broadcast.
Geology in the Development of Mineral Resources, by E. D. Ingall. Radio Broadcast.
Let Race Alone, by E. Sapir. The Nation, February 25, 1925.
Folk Songs of French Canada, by C. M. Barbeau and E. Sapir. Yale University Press.
A Bella Coola, Carrier, and Chilcotin Route Time Recorder, by Harlan I. Smith. American Anthropologist, N.S., vol. 26, April-June, 1924.
Sympathetic Magic and Witchcraft among the Bella Coola, by Harlan I. Smith. American Anthropologist, N.S., vol. 27, January-March, 1925.
The Petroglyph at Aldridge Point, near Victoria, British Columbia, by Harlan I. Smith. American Anthropologist, N.S., vol. 26, October-December, 1924.
Trephined Aboriginal Skulls from British Columbia and Washington, by Harlan I. Smith. American Journal of Physical Anthropology, vol. VII, October-December, 1924.
The End of Alexander Mackenzie's Trip to the Pacific, by Harlan I. Smith. Annual Report of the Canadian Historical Association for 1924.
Eagle Snaring Among the Bella Coola Indians, by Harlan I. Smith. Canadian Field Naturalist, vol. XXXVIII, November, 1924.
Cawing-Raven and Nelly, Salmon-fishing Indians of the Skeena River, by C. M. Barbeau. Canadian Magazine, September, 1924.

Myths and Traditions from Northern Alaska, the Mackenzie Delta, and Coronation Gulf, by D. Jenness. Report of the Canadian Arctic Expedition, 1913-1918, vol. XIII, part A.
Eskimo String Figures, by D. Jenness. Report of the Canadian Arctic Expedition, 1913-1918, vol. XIII, part B.
Examples of Graphic Art on Archæological Artifacts from Ontario, by W. J. Wintemberg. Transactions of Royal Society of Canada, 3rd Series, vol. XVIII, 1924.
The Privilege Concept among the Nootka Indians, by E. Sapir. British Association for the Advancement of Science, Toronto, 1924.
Totem Poles, by E. Sapir. Radio Broadcast.
Race and Culture, by E. Sapir. University Club of Ottawa, December 11, 1924.
Observations on Athabaskan Pitch Accent, with Special Reference to Kutchin, by E. Sapir. American Anthropological Association, Washington, January 2, 1925.
Sounds and Sound Patterns in Language, by E. Sapir. American Association for Advancement of Science, Section L, Washington, January 3, 1925.
The Psychology of Culture, by E. Sapir. The People's Institute, Cooper Union, New York, January 11, 1925.
Race, by E. Sapir. Gastronomic Club, Ottawa, March 18, 1925.
Talks on the Archæology and Indians of Canada, by Harlan I. Smith. British Association for the Advancement of Science, Vancouver, B.C., August 26 and 27, 1924.
Some Folk Songs of French Canada, by C. M. Barbeau. American Folk-Lore Society, Canadian Branch, Ottawa, April, 1924.
Indian Eloquence, by C. M. Barbeau. Royal Society of Canada, Section II, Quebec, May, 1924.
Temlaham, an Indian Paradise Lost in Northern British Columbia, by C. M. Barbeau. Canadian Historical Association, Quebec, May, 1924.
Tsimshian Heraldry, by C. M. Barbeau. British Association for the Advancement of Science, Toronto, August, 1924.
The Establishment of a National Park on the Upper Skeena, by C. M. Barbeau. Hazelton, B.C., November, 1924.
The Establishment of an Indian National Park on the Upper Skeena, by C. M. Barbeau. American Folk-Lore Society, Canadian Branch, Ottawa, January, 1925.
The Indians of the Upper Skeena, by C. M. Barbeau. Rotary Club, Ottawa, February, 1925.
The Gitksan Indians and Their Totem Poles, by C. M. Barbeau. Gastronomic Club, Ottawa, February, 1925.
The Artistic Themes Furnished to an Artist (W. Langdon Kihn) by the Skeena River Indians, by C. M. Barbeau. Ottawa Women's Art Club, March, 1925.
An Indian Paradise Lost on the Upper Skeena, by C. M. Barbeau. France-Amerique, Parliament Buildings, Ottawa, March, 1925.
The Education of an Ancient Carrier, by D. Jenness. British Association for the Advancement of Science, Toronto, August, 1924.
A Day in an Eskimo Snow Hut, by D. Jenness. Radio Broadcast.
A Tentative Characterization of Iroquoian Cultures in Ontario and Quebec, as Determined from Archæological Remains, by W. J. Wintemberg. British Association for the Advancement of Science, August, 1924.
What We Owe to the Indians, by W. J. Wintemberg. Radio Broadcast.
Mammal Life in the Heart of Gaspe, by R. M. Anderson. American Society of Mammalogists, at Museum of Comparative Zoology, Harvard University, April 17, 1924.
Scientific Work of the Southern Party of the Canadian Arctic Expedition, 1913-18, by R. M. Anderson. British Association for the Advancement of Science, 94th Annual Meeting at Toronto, Section E (Geography), August 8, 1924.
Present Status and Future Prospects of the Larger Mammals of Canada, by R. M. Anderson. British Association for the Advancement of Science, Toronto, Section E (Geography), August 8, 1924. Printed in Scottish Geographical Magazine, November, 1924.
Bent Grasses, with Special Reference to the Utilization of Native Species in Preference to Forms Imported from Europe, by M. O. Malte. Canadian Golfers' Association Annual Meeting, Toronto, February 7, 1925.
The Commercial Bent Grasses (two lectures), by M. O. Malte. Short Courses for Green Keepers, Toronto, March 3, 1925.
Birds, by C. L. Patch. Gilwell Scout Camp, Black Rapids, Ont., July 12, 1924.
Our Animal Life, by C. L. Patch. Teachers' Convention, Madoc, Ont., October 9, 1924.
Reptiles and Amphibians, by C. L. Patch. Masonic Lodge, Masonic Temple, Ottawa, November 12, 1924.
The Birds of Bonaventure, by C. L. Patch. Broadway Public School, Westboro, March 17, 1925.
Birds of the Week, by C. L. Patch. Radio Broadcast.
Some Wild Animals You Should Know, by C. L. Patch. Radio Broadcast.
Fall Bird Life at Ottawa, by C. L. Patch. Ottawa Citizen, December 6, 1924.
Winter Bird Life at Ottawa, by C. L. Patch. Ottawa Citizen, January 17, 1925.
Amphibians and Reptiles of Canada, by C. L. Patch. Revue Benjamin, Paris.

Birds of the Week, by C. E. Johnson. Radio Broadcast.
Birds of the Week, by C. E. Johnson. Radio Broadcast.
Birds of the Week, by C. E. Johnson. Radio Broadcast.
Some Nature Notes for March, by C. E. Johnson. Radio Broadcast.
Birds Mobbing Felting on a Fence-post, by C. E. Johnson. Canadian Field Naturalist, Ottawa, vol. 38 (special number), May, 1924.
Notes on Flickers' Roosts, by C. E. Johnson. Canadian Field Naturalist, Ottawa, vol. 38, September, 1924.
A Red Squirrel's Christmas Dinner, by C. E. Johnson. Canadian Field Naturalist, Ottawa, vol. 38, September, 1924.
Mines Branch Investigations in 1924, by John McLeish. Canadian Mining Journal, July, 1924, and other publications.
Metal Mining in Canada in 1924, by John McLeish. High Commissioner, London.
Precious Metals in Canada, by A. W. G. Wilson. Handbook of Canada for the British Association for the Advancement of Science, August, 1924.
Gold in Canada, by A. W. G. Wilson. High Commissioner, London.
Chemical, Metallurgical, and Allied Industries in Canada, by A. W. G. Wilson. High Commissioner, London.
New Development in the Turner Valley Oil Field, Alberta, by R. T. Elworthy. High Commissioner, London.
Natural Gas in Canada and Its Uses, by R. T. Elworthy. Society of Chemical Industry (Canadian Chemical Convention).
Standards of Weight and Measure, by R. T. Elworthy. Ottawa Section, Society of Chemical Industry.
Helium in Canada, by R. T. Elworthy. Canadian Mining Journal, December 19, 1924.
Bituminous Sands of Alberta, by S. C. Ells. Annual General Meeting, Ottawa, Canadian Institute of Mining and Metallurgy; Bulletin of Canadian Institute of Mining and Metallurgy, March, 1925.
Oil-shales of Canada, by S. C. Ells. Annual General Meeting, Ottawa, Canadian Institute of Mining and Metallurgy; Bulletin of Canadian Institute of Mining and Metallurgy, March, 1925.
Oil-shales of Canada, by S. C. Ells. High Commissioner, London.
Clays of Northern Alberta, by S. C. Ells. High Commissioner, London.
Largest Known Deposit of Tar Sand in Alberta, by S. C. Ells. Natural Resources, August, 1924.
Sodium Sulphate in Western Canada, by L. H. Cole. Society of Chemical Industry (Canadian Chemical Convention), Kingston, May, 1924.
Sodium Sulphate in Canada, by L. H. Cole. Natural Resources, November, 1924.
Titanium White, by A. H. A. Robinson, High Commissioner, London.
A Possible New Use for Titaniferous Iron Ore, by A. H. A. Robinson. High Commissioner, London.
The Goldfields of Northwestern Quebec, by A. H. A. Robinson. High Commissioner, London.
Canada Is One of the World's Greatest Mica Producers, by H. S. Spence. High Commissioner, London.
Canada Possesses Valuable Talc Resources, by H. S. Spence. High Commissioner, London.
Canada Has One of the World's Largest Plumbago Deposits, by H. S. Spence. High Commissioner, London.
Canadian Soapstone Deposits Likely to Prove Valuable Asset, by H. S. Spence. High Commissioner, London.
Canada's Barytes Resources, by H. S. Spence. Canadian Mining Journal, November 14, 1924.
Increased Demand and Use for Garnets, by V. L. Eardley-Wilmot. Canadian Mining Journal, July 18, 1924.
The Origin and Uses of Diatomaceous Earth, by V. L. Eardley-Wilmot. Canadian Mining Journal, September 19, 1924.
Revival of Canadian Molybdenum, by V. L. Eardley-Wilmot. High Commissioner, London.
Beryllium from Canada—A Possible Source of Supply, by V. L. Eardley-Wilmot. High Commissioner, London.
The Metallurgical Industry, by W. B. Timm. Industrial Canada, January, 1925.
The Gold Fields of Northwestern Quebec, by W. B. Timm and A. H. A. Robinson. Canadian Mining Journal, February 20, 1925; Financial Post, Toronto, February 27, 1925.
Concentration of the Lead Zinc Ores of Eastern Canada, by C. S. Parsons. Annual General Meeting, Canadian Institute of Mining and Metallurgy, March, 1925.
Bathurst Iron Mine, by C. S. Parson. Canadian Mining Journal, December 4, 1924.
The Lake George Antimony Ores and Their Concentration, by C. S. Parsons. Canadian Mining Journal, October 3, 1924.
The Fuel Resources of Canada and Their Utilization for the Production of Power and Other Purposes, by B. F. Haanel. World Power Conference, London, England, June, 1924. Published Journal of the Engineering Institute of Canada, July, 1924.

Some Canadian Non-Metallic Minerals—A Review of Fifteen Years' Progress, by A. W. G. Wilson, V. L. Eardley-Wilmot, L. H. Cole, and H. S. Spence. Annual General Meeting, Ottawa, Canadian Institute of Mining and Metallurgy. Pub. in Bulletin of Canadian Institute of Mining and Metallurgy, March, 1925.

A Trip Through Wembley, by A. W. G. Wilson. Professional Institute of the Civil Service of Canada, March, 1925.

A Ramble Through Wembley, by A. W. G. Wilson. Canadian Institute of Mining and Metallurgy, March, 1925.

My Impressions of the World Power Conference, by B. F. Haanel, Engineering Institute of Canada, Ottawa Branch, October, 1924.

Ceramic Exhibit at Wembley, by H. Frechette. Canadian National Clay Products Association, January, 1925.

Bituminous Sands of Northern Alberta, by S. C. Ells. Board of Trade, Edmonton, Alta.; Manitoba Branch, Winnipeg. Canadian Institute of Mining and Metallurgy. Board of Trade, Petrolia, Ont.

The Householder's Coal Supply, by F. G. Neate. Canadian Mining Journal, October 17, 1924.

A course of lectures on natural resources was again put on during the winter in the lecture hall of the Museum and was very well attended. Lecturers were secured from our own staff as well as from the Departments of Interior and Agriculture; the moving pictures were supplied by the Department of Trade and Commerce.

Two representatives of the department were present during the summer of 1924 at the British Empire Exhibition for the purpose of imparting information on the mineral resources of Canada, and of interesting British capital in their development. To what extent the latter object was attained it is as yet difficult to say, but from the nature and the number of the inquiries made it is confidently expected that much good will result. One conclusion which may safely be arrived at is that there is a growing feeling in Great Britain that Canada may be relied upon to provide a very large portion of the raw minerals necessary for industrial development as well as for Empire defence. Pamphlets dealing with economic minerals and the mineral industries were prepared specially for the Exhibition and were very widely distributed. Two conferences held in London during the Exhibition, namely, the Empire Mining and Metallurgical Congress and the First World Power Conference, were attended by representatives from the department.

The amalgamation of the Imperial Institute and the Imperial Mineral Resources Bureau, recommended by the Imperial Economic Conference, 1923, was not consummated during 1924, but a bill providing for this was presented to the British Parliament and when passed will be effective July 1, 1925. Appropriations amounting to $12,849, representing Canada's contribution to the reorganized Institute, are voted through the Department of Mines. The Institute will in future be mainly a clearing house of information on the natural resources of the Empire and will be provided with laboratories to undertake only preliminary investigations of raw materials for ascertaining their commercial value. No research work of an exhaustive character will be undertaken, but when such work is necessary it will be referred to appropriate organizations in Great Britain or elsewhere in the Empire.

Since the disbanding of the Joint Peat Committee in 1923 the plant at Alfred was disposed of under certain conditions to a company incorporated as Peat Fuels Limited. This company, however, was not successful in starting the manufacture of peat during 1924. Arrangements have since been made for remodelling the plant along the lines recommended by the Peat Committee, with the object of commencing manufacture of peat fuel as soon as the season of 1925 opens. The mechanical details of operations have all been satisfactorily worked out and costs have been determined, so that there is now no reason why the manufacture of peat fuel should not be a commercial success. The people of this country have been so long accustomed to the use of anthracite

that it is difficult to persuade them to use anything else. The time is rapidly approaching, however, when substitute fuels will have to be used, and one of them will be peat.

With the resignation of the original Lignite Utilization Board in March, 1924, a new board was appointed on which the Deputy Minister of Mines became the representative of the Dominion Government and Mr. T. M. Molloy the representative of the Saskatchewan Government. No representative from the Manitoba Government was appointed as that Government had previously withdrawn from participation in the work of the Board. By agreement of the three Governments the plant at Bienfait was transferred to the Saskatchewan Government and that Government has been negotiating with private parties who will take over and operate the plant on a commercial scale.

In addition to becoming a member of the Lignite Utilization Board, the duties of the Deputy Minister of Mines were increased by his being appointed in December a member of the Honorary Advisory Council for Scientific and Industrial Research.

The value of the minerals produced in Canada during 1924 was about $209,500,000. This is a decrease from 1923 of about $4,500,000 and is accounted for by decreases in the output of non-metallics, mainly coal, and of structural materials and clay products. The production of metallic minerals on the other hand showed an increase in value of about $18,500,000. Labour troubles in the west were responsible for the decreased production of coal, and delayed building programmes reduced the demand for structural materials and clay products.

In spite of the slight fall in the value of the production the mining industry cannot be described as being in anything but a healthy condition. It has a capital investment over $500,000,000 and employs directly about 60,000 men. It consequently occupies third place among the primary Canadian industries and is exceeded only by agriculture and forest products. While it has shown during the last forty years an extraordinarily steady growth with only minor fluctuations, the possibilities of mineral production for the future are of greater interest. Three factors taken together give an indication of what this future is likely to be, namely:

(1) Past performance of the industry.
(2) The great extent of our unprospected country.
(3) Increasing world demand for minerals.

During the thirty-year period from 1894 to 1924 the curve of mineral production shows an average annual increase of about $6,300,000 a year. Allowing for a normal increase in population with a consequent increase in consumption, and taking into consideration the fact that a very large proportion of our country, estimated at about 80 per cent, is as yet absolutely unprospected, it is only reasonable to expect this rate of increase will be continued for some years to come.

There is, however, the third factor, namely, the increasing world demand for minerals, that is likely to accelerate greatly the rate of increase in production. No one who has studied the world production and consumption of minerals can fail to be impressed with the force of the circumstances which are ceaselessly increasing the world's mineral consumption and which are compelling the older highly developed countries of the world, through the exhaustion of their own natural resources, to look to the newer countries to supply their deficiencies. These circumstances will undoubtedly lead to the quicker and more thorough development of Canada's resources.

Especially among the western nations world consumption of minerals has increased at a far more rapid rate than the growth of population. According

to the best estimates the population of the world during the last forty or forty-five years has grown by about 30 per cent. Within the same period coal production has risen by about 300 per cent, pig-iron output by nearly 300 per cent, copper production by over 1,000 per cent, and petroleum by more than 2,000 per cent. A similar rate of growth is apparent in most other industrial minerals, indicating the extraordinary drain that modern civilization imposes on mineral resources.

The significance of this to Canada is important because of her geographical relationship to the greatest mineral consuming nation of the world. With about 5 per cent of the world's population the United States is said to consume about 42 per cent of the world's output of coal, 53 per cent of the iron, 57 per cent of the steel, 44 per cent of the copper, and 73 per cent of the oil. The United States has enormous mineral resources of its own and has an exportable surplus of many important minerals, yet there is little doubt that its market will sooner or later place a premium upon every valuable mineral occurrence in the Dominion of Canada, just as it has already done with certain of our other natural resources.

These factors are the basis of a well-founded optimism regarding the future of Canada's mineral producing industry.

The development of mineral manufacturing industries of necessity lags somewhat behind the mineral producing industries, but for a young and growing country Canada's position in this respect shows that considerable progress has been, and is being, made. The number of plants in operation during 1924 and turning out manufactured articles of mineral origin was 10,719. These plants had a capital investment of $1,550,000,000 and provided articles to the value of $879,000,000. The Department of Mines is not so much concerned with this phase of industry as it is with the primary industries of production and of later treatment and reduction of ores, but the position of the mineral manufacturing industries is cited as evidence of the relative strength and value to the country of these two groups of industries and the necessity of developing those secondary manufacturing industries that may be based upon our own raw mineral products.

Dominion Fuel Board

The Dominion Fuel Board, during the year, successfully completed three important investigations and also collected much valuable data relating to the fuel situation.

The report dealing with "Coke as a Household Fuel in Central Canada," by J. L. Landt, was issued during the year. One of the chief advantages derived from this work is that considerable interest has been aroused, especially throughout Ontario and Quebec, as to the true value of coke as a household fuel. The substitution of coke for American anthracite will do much to reduce our dependence on this coal which in recent years has become subject to serious fluctuations in supply owing to labour difficulties.

An investigation was also made of certain of the higher grade coals of Alberta, namely those situated in the Smoky River and Kananaskis areas, with a view to determining their physical and chemical composition and their handling qualities. Mr. James McEvoy, a well-known mining engineer of Toronto, was engaged to carry out this work and his report entitled "The Smoky River Coal Field" was issued as a result.

"Central and District Heating, Possibilities of Application in Canada" is the title of another report issued by the Board during the past year. It is an economic report pointing out savings which might be effected by central heating plants in the more populous centres. The use of lower grade fuels through this system of heating is fully explained. The report has had wide distribution throughout the country.

The co-operation of the Geological Survey, Natural Resources Intelligence Service, and the Mines Branch, was freely given in these investigations. A great deal of similar work is under way and the work being carried out in conjunction with the Mines Branch is of special interest, particularly the investigation dealing with the coking qualities of the coals of the Maritime Provinces. Work under the same auspices has also been commenced on the power fuel survey and it is the intention to collect all available information of the various power and industrial plants using coal with a view to determining in what quantity coal is used and the purposes. The result of this investigation will enable the Board to advise if it would be possible to replace small, isolated plants by central district power plants and will also make available information as to the possibility of substitution by hydroelectric energy for the small steam-power plants.

As the successful operation of by-product recovery coke ovens for the manufacture of a domestic coke is dependent on the disposal of all the surplus gas, the Fuel Board turned its attention to outlets other than domestic for the disposal of the gas. Attention in this connexion was directed to an announcement by the Hydro-Electric Power Commission of Ontario, to the effect that consideration was being given to the erection of a steam-electric plant of 100,000 horsepower capacity in the vicinity of Toronto, for the purpose of supplying hydroelectric energy for peak-load demands.

The Fuel Board, after studying the situation, was of the opinion that if the Hydro-Electric Power Commission could erect and operate a by-product recovery coke oven plant in conjunction with the steam-electric plant, two problems, namely, the domestic fuel problem of Ontario and the generation of steam-electric energy, would be solved simultaneously, the latter from the utilization under boilers of the gas produced in the course of the manufacture of a domestic coke.

In order to learn whether the Hydro-Electric Power Commission would be interested in such an undertaking, the Minister of Mines arranged a meeting of the engineers of the Hydro-Electric Power Commission and of the Fuel Board. At this meeting the power requirements of the Hydro-Electric Power Commission were discussed and a report was prepared by the Fuel Board outlining the type and size of coke plant which would be required to furnish the gas for the generation of steam, which would fit these conditions.

The cost of hydroelectric energy by this method was calculated to show a considerable reduction in the cost of electricity a horsepower year over that of the best steam-electric plant of 100,000 horsepower capacity using raw coal in any form.

The Secretary's office continued the annual survey of the substitute fuels used in the central provinces for domestic purposes. The results of this survey indicate the increasing popularity of coke, British anthracite, and other of the so-called "substitute fuels."

The secretary of the Board made a visit to the American coal fields in order that the Board might be familiar with the quality of the various coals shipped to the Canadian market, the mining methods employed, and the quality of the coal in the different fields.

The Board further co-operated with the Mines Branch in the making of comparative heating tests of the different domestic fuels available. This investigation is still under way and further tests are being made in standard house furnaces of both American and Canadian fuels.

Other investigations being undertaken, some of which are in progress, are as follows:

The use of wood as an auxiliary fuel in Ontario and Quebec.
House construction and insulation.

The Board administered the subvention under which a considerable tonnage of Nova Scotia coal was moved to points in Ontario and Quebec. With this subvention, which amounted to one-fifth of a cent a ton a mile, assistance was given to this industry to extend its markets into territory previously dominated by the foreign coal.

In briefly summarizing the work carried out during the past year, two very important facts stand out, namely, the reduction in importance of American anthracite and the development of a market for British anthracite. During the period under review no less than 1,000,000 tons of American anthracite were displaced by the use of British anthracite, coke, bituminous coals, and oil.

Your obedient servant.

CHARLES CAMSELL,
Deputy Minister.

OTTAWA, July 31, 1925.

GEOLOGICAL SURVEY

W. H. Collins, Director

CHANGES IN ORGANIZATION AND STAFF

In 1843, the first active year of its existence, the Geological Survey of Canada consisted of the Provincial Geologist, W. E. Logan, and one geologist, Alexander Murray; last year (1923-24) the staff numbered ninety-four. Originally the only Government institution engaged in exploration and investigation of the natural resources of the country, it has become increasingly preoccupied with the needs of a prosperous and growing mineral industry, and in maintaining liaison with the numerous federal and provincial organizations which now share activities that have grown too great for one body. It, therefore, results that although the field of scientific endeavour of the Survey has narrowed, the attendant executive duties have grown heavier and more diversified. Last year further much-needed provision for executive help was made by creating a position of Chief Geologist, to which G. A. Young was appointed on November 1.

There were other important changes in the staff. P. H. Selwyn, who had been with the Geological Survey for forty-four years, son of the second Director, and a most loyal and energetic officer, was granted superannuation on July 1. His place was filled, December 11, by transfer of H. W. Cheney from the Department of the Interior. Superannuation was also granted to L. N. Richard, relief map-maker, who had rendered excellent service for forty-two years. Resignations were received from R. Harvie and M. E. Hurst. W. S. Dyer, F. A. Kerr, J. B. Mawdsley, and J. F. Walker were appointed as assistant geologists. By the death of E. J. Whittaker, palæontologist, on September 14, a career only approaching maturity, but of great promise, was cut short.

CO-ORDINATION OF WORK

The liaison work referred to above merits some explanation. Most of the provinces maintain departments of mines or other organizations for the development and administration of their mineral resources and mining industries. To co-ordinate its work with similar provincial activities, the Geological Survey sends to provincial officials, or exchanges with them, early in each year, a provisional programme of contemplated field operations, which may afterwards be amended to meet requirements better or to prevent overlap. When the Survey's field programme for all Canada is complete it is made known to all interested parties by publishing it in various periodicals. When a season's programme has been carried out the results of each operation are either reported in full or announced in the annual summary report of the Geological Survey and also announced in the annual administrative report of the department, so that complete public information is available.

An annual summary of mineral discoveries and related developments is contributed to the Imperial Mineral Resources Bureau, London, an organization jointly supported by the Dominions and Mother Country for collating and disseminating information regarding the mineral resources of the Empire. A regular series of news-letters on the same subject is supplied to the High Commissioner's office, in London, for distribution to the British press.

In the federal service no other department is engaged in geological work, but valuable help is given the Geological Survey in the collection of deep borings

records in the Prairie Provinces by Director O. S. Finnie and staff of the North West Territories and Yukon Branch, Department of the Interior. Considerable geological information about the Arctic region has also been supplied by this branch, and next year (1925) a geologist from the Geological Survey will accompany the annual expedition of the Canadian Government steamer *Arctic* to the north.

Topographical and geographical surveys are made by the Departments of the Interior, Mines, and National Defence, and maps of this nature are published by each. On March 8, 1922, by common agreement of these departments, a Board of Topographical Surveys and Maps was created (P.C. 540) to bring these organizations into closer alignment as regards survey and map standards and to obviate duplication. This plan is in operation in the United States, and is apparently better suited than a more centralized organization would be for the conditions that obtain in Canada and are likely to continue for generations. Canada has an area of over 3,500,000 square miles, with a population of about 9,000,000 concentrated along the southern border. Exploration and survey of the northern part are rendered exceptionally difficult and costly by reason of uneven settlement, lack of transportation facilities, and rugged physical features. A centralized survey organization supplied with several millions of dollars each year could not effectively survey Canada in a century, even if such a survey were required, and such a survey once made would need constant revision. Actual requirements outside the well-settled southern part are largely confined to localities where the mineral wealth, waterpower, and other natural resources are being developed, and these can undoubtedly be satisfied most effectively and economically by the Government departments immediately concerned, especially as most of the benefits of a larger centralized survey organization can be secured by means of the co-ordinating board now in existence.

MUSEUM WORK

Shortly after the Geological Survey was created, in 1842, it commenced to collect and display specimens, and by 1905 had on exhibition in its quarters on Sussex street the largest natural history museum in Canada, comprising geological, mineralogical, botanical, zoological, and anthropological collections. Better and larger quarters for expansion of its museum activities were afterwards provided by construction of the Victoria Memorial Museum, to which building the Survey and its collections were transferred in 1910.

There followed, however, a succession of adverse events which have interfered greatly with the anticipated expansion. During the Great War non-essential Government activities of this sort were practically suspended and have been resumed only on a greatly reduced scale because of the need for general economy. In 1915, when the Parliament buildings were burned, the Museum building was hastily vacated for legislative needs and the Museum collections were distributed in various other buildings. There they remained for five years. In 1920, when the Victoria Memorial Museum was once more available for its original purpose, the space requirements of the collections and staff had so increased and the available space been so curtailed that only three of the Museum divisions (geology and palæontology, biology, and anthropology) could be accommodated. The division of mineralogy had to be left in temporary quarters at 227 Sparks street. In that year, also, two of the Museum divisions (anthropology and biology) were placed under a Director of the Victoria Memorial Museum, while the other two divisions (geology and palæontology, and mineralogy) remained in the Geological Survey.

These handicaps persist and are largely responsible for the retarded development of the Museum. Nevertheless, progress is being made in various directions. During the year a series of experimental units for an exhibition of the economic

minerals of Canada and their products were assembled temporarily in the entrance hall of the Victoria Memorial Museum. These include the hydrocarbon series (coal, bitumens, petroleums, and gases), a magnesian mineral series (asbestos, talc, etc.), and a clay and shale series. Materials for other units will be assembled next year. The extremely valuable systematic mineral collection, which has been in process of accumulation for three-fourths of a century and includes over 25,000 specimens, is being reassembled for exhibition with the expert assistance of Dr. W. F. Ferrier, and a modern type of exhibition case is being constructed for it.

The collection of geological and palæontological specimens is likewise being classified and arranged into public exhibit and reference collections by the staff, aided by such temporary assistance as can be provided. The type of exhibit case used for the systematic mineral collection will also be used for exhibits of fossils. Important additions, especially of dinosauria and other vertebrate remains, are also being made by our own collector, C. M. Sternberg, and by exchange with other institutions.

FIELD WORK

Forty-seven parties were engaged in field work during the summer of 1924, although the total number of permanent field officers on the staff is only forty-one. The remaining parties were headed by professors of geological sciences or by Canadian post-graduate students, an arrangement which simultaneously provides the Geological Survey with enthusiastic field workers at very moderate cost and affords field training for university teachers and research students. Field experience was also afforded to about eighty students from Canadian universities, who were employed as assistants.

These forty-seven parties were distributed throughout Canada as far north as Yukon, and from British Columbia to Nova Scotia. They were occupied with a diversity of surveys and scientific and technical investigations which are explained in succeeding pages; but directly or indirectly each operation is intended to give scientific and practical assistance in the search for the hidden mineral wealth of the country. How successful this search has been in the past is indicated by the value of the mineral production from year to year:

1890	$ 16,763,353
1900	64,420,877
1910	106,823,623
1920	227,859,665

This production includes an exceptional variety of metallic and non-metallic materials and about 90 per cent of the world's supply and output of such essential industrial materials as nickel and asbestos. A vast territory remains to be explored more thoroughly, and from it an encouraging number of discoveries continue to be made. During 1924 additional valuable finds of gold and copper ores have been made in the "Rouyn" district of northwestern Quebec, additional discoveries of silver-lead ores have been made in Mayo district, Yukon, and some petroleum was found near Wainwright, Alberta. Certain other areas appear to be quite as promising of mineral wealth. The attention of the Geological Survey is being directed in particular to a belt of country about 100 miles in average width that stretches through the interior of British Columbia and Yukon along the eastern margin of the Coast Range granite. Important deposits of silver, lead, zinc, and other metals, related in origin to this granite, have been found at numerous points along this belt from Mayo to the Sullivan mine in southern British Columbia, and explorations are being conducted in other less-known sections of the belt with a view to encourage and facilitate prospecting work. A second territory of great promise is that in Nova Scotia and New Brunswick underlain by the strata known as the Windsor series. In

this series there appear to be confined extensive deposits of salt and gypsum, which because of their seaboard location and proximity to an abundant supply of coal should ultimately constitute a basis for a series of chemical industries.

GEOLOGICAL DIVISION

G. A. Young, Chief Geologist, reports:

Thirty-one geological parties carried on field work in various parts of Canada during the summer of 1924.

Yukon

W. E. Cockfield made a detailed examination of the silver-lead deposits of Upper Beaver River area, Mayo district, and geographically and geologically surveyed an area in the general vicinity of the deposits. A full account of this work, accompanied by a map, appears in the Summary Report, 1924, Part A. Mr. Cockfield also completed the mapping of a quadrangle between latitudes 60 and 61 degrees and longitudes 134 and 136 degrees in the vicinity of Whitehorse. This work was commenced in 1922; its completion permits the preparation for publication of a map and report dealing with an area of 4,500 square miles within which occur various types of mineral deposits.

British Columbia

George Hanson studied and geologically mapped Driftwood Creek 15-minute quadrangle in Babine mountains, Coast district. This area includes various silver-lead and gold-bearing deposits which have attracted much attention. A full report upon, and a geological and topographical map of, the area are contained in the Summary Report, 1924, Part A. Mr. Hanson also made a geological reconnaissance of the country along the Canadian National railway, between Prince Rupert and Burns lake. An account of this work is presented in the Summary Report, 1924, Part A.

J. R. Marshall commenced a geological reconnaissance of a large area around Whitesail and Eutsuk lakes, Coast district. The area includes part of the border of the Coast Range batholith, along the edge of which valuable mineral deposits have been found in other localities. The results of the field work with descriptions of various mineral deposits already found in this but little prospected area, are incorporated in the Summary Report, 1924, Part A.

Victor Dolmage spent the greater part of the field season geologically and topographically mapping a large area in the vicinity of Tatlayoko, Chilko, and Taseko lakes, Coast and Lillooet districts. This little known, but easily accessible, area includes a part of the eastern border of the Coast Range batholith, which elsewhere is characterized by the presence of silver, lead, zinc, and valuable mineral deposits. A report upon the area, accompanied by a map, appears in the Summary Report, 1924, Part A. Mr. Dolmage also geologically mapped the country adjacent to Powell lake. The results of this work will be incorporated in an 8-mile map and report dealing with that part of British Columbia west of longitude 122 degrees and south of latitude 52 degrees.

C. E. Cairnes conducted a geological reconnaissance along the valley of Harrison lake and Lillooet river. Special attention was given to the mineral deposits in the area directly tributary to the Pacific Great Eastern railway. A full report on these, with a geological map, is contained in the Summary Report, 1924, Part A. The whole field work forms an important contribution to the 8-mile geological map and report dealing with the southwestern part of the province, upon which Mr. Dolmage and Mr. Cairnes are now engaged. Mr.

Cairnes also examined a nickeliferous deposit in the basin of Emory creek, west of Choate on Fraser river. An account of this deposit, the first of its kind to be recorded in the province, is given in the Summary Report, 1924, Part A.

W. L. Uglow completed a detailed investigation of the iron ores, which was begun in 1922 by G. A. Young and continued in 1923. This investigation was undertaken at the request of the provincial Department of Mines and municipal organization with a view to ascertain whether the known iron ore deposits would warrant establishing an iron and steel making industry in the province. A report upon the results of the investigation is now being prepared. Mr. Uglow during the past season examined all the known iron ore deposits near the west coast of Vancouver island and one deposit on North Thompson river, south of Birch island.

M. E. Hurst examined in detail various deposits of arsenical ores which had not previously been examined by other officers of the Geological Survey or which required re-examination. In 1923 Mr. Hurst dealt in like manner with eastern Canada, with the intention of preparing a report upon the occurrence of arsenic-bearing deposits throughout Canada. This investigation is now completed and the report is being prepared. Mr. Hurst, in 1924, examined certain tungsten deposits near Hazelton. A description of these deposits is given in the Summary Report, 1924, Part A.

J. F. Walker completed a systematic geological survey of Windermere map-area, in the southeast, which was begun in 1921 by S. J. Schofield and continued in 1922 and 1923 by M. F. Bancroft. The map-area lies near Invermere and comprises 700 square miles of territory in which silver-lead ores have been found and mined and its geology is an essential link in the geological study of this part of the province. A memoir descriptive of the geology and mineral deposits of the area is now in course of publication.

C. H. Crickmay geologically mapped the shores of Harrison lake, also in the southeast, paying especial attention to the securing of palæontological evidence so necessary for the elucidation of the geology of this and neighbouring areas wherein mineral deposits occur.

W. A. Johnston during September paid a brief visit to Barkerville area, Cariboo district, for the purpose of collecting additional information regarding placer-mining operations, for inclusion in a memoir on this subject, under joint authorship with W. L. Uglow, which is now being prepared for press.

Alberta and Saskatchewan

G. S. Hume commenced a detailed geological study of a large area extending from the Viking natural gas field, Alberta, eastward into Saskatchewan. Petroleum has been found within this area in the vicinity of Wainwright. A close study of both the major and minor geological structures with which the supplies of gas and petroleum are associated was made, and important conclusions of direct, practical importance to those searching for gas and oil are contained in a report being published in the Summary Report, 1924, Part B.

Bruce Rose completed the investigation and geological mapping of the coal deposits and related rock formations in Blairmore map-area, southwestern Alberta. A report upon this work and a revised edition of Blairmore map-sheet are being prepared.

M. Y. Williams continued a systematic re-survey of the geological succession, structure, and mineral resources of an area in southern Alberta and adjacent parts of Saskatchewan and British Columbia, extending from the International Boundary north to latitude 52° and from longitude 109° west to 150° 30′. This work was begun in 1923 jointly by Mr. Williams and the late E. J. Whittaker. During 1924, owing to the illness of Mr. Whittaker, his share of the work was in part carried on by A. J. Childerhose.

B. R. MacKay commenced a detailed geological survey of the coal measures and associated strata in the vicinity of Mountain Park on the Canadian National railway in western Alberta. An area of 400 square miles was mapped for publication on a scale of 1 inch to 1 mile. Publication of a report and maps is being withheld until the investigation has progressed further, but hand-coloured geological plans of the coal measures have been prepared for the interim use of coal-mining companies within the area.

J. S. DeLury completed the study and mapping of the Deschambault-Wapawekka Lakes area in Saskatchewan. The area, 75 miles long from east to west, lies along the southern edge of the Precambrian rocks of northern Saskatchewan. A full report on the area, accompanied by a geological map, is being published in the Summary Report, 1924, Part B.

Manitoba

J. F. Wright closely studied and mapped the Oiseau River area in south-eastern Manitoba. The map-area lies north of Winnipeg river, extends west from the Ontario boundary, and has an area of 450 square miles. Copper-nickel and other mineral deposits occur within the area and a full report upon them, as well as upon the whole map-area, is being published, together with a map, in the Summary Report, 1924, Part B. Mr. Wright also examined recently discovered gold-bearing quartz veins of the Beresford Lake area.

Ontario

T. L. Tanton studied and mapped in detail an area embracing the central and eastern part of the Matawin iron range, Thunder Bay district. This area, at various times, has attracted much attention as a possible source of iron ore. A full report upon the iron range is being included in the Summary Report, 1924, Part C.

J. E. Gill studied a part of the northern margin of the area of the Animikie formation, which extends southwestward from Port Arthur, Ontario, into Minnesota, the part examined being about 25 miles long and lying between Whitefish lake and the International Boundary. In Minnesota, the Animikie formation contains the Mesabi and other high-grade deposits of iron ore; in Ontario lean beds of iron ore have been known for many years and have given rise to a hope that larger deposits exist. With this in mind, Mr. Gill studied the Animikie strata where they are best exposed to ascertain the thickness of the iron-bearing member at various points and the possibilities of concentrations of iron minerals having occurred. Mr. Gill's report is being published in the Summary Report, 1924, Part C.

R. C. Emmons made a geographical and geological survey of the townships of Otter, Haughton, Bridgland, and Kirkwood, north of Thessalon, Ontario. The Precambrian strata underlying the area are specially interesting from the standpoint of general knowledge of the geology of the Canadian Shield and also contain small bodies of copper, gold, and cobalt-silver minerals. The results of Mr. Emmons' work in the district during 1923 and 1924 are embodied in Memoir 143 recently published. Mr. Emmons at the close of the field season made an examination of certain occurrences of " iron formation " north of Sault Ste. Marie.

Ellis Thomson completed a detailed geographical and geological survey of a 15 by 30-minute quadrangle (400 square miles) near Woman River, Ontario. The area contains "iron formation" and is geologically favourable for the existence of other metalliferous deposits. It is proposed to continue field work in an adjacent map-area before publishing a report upon the work done.

T. T. Quirke continued a detailed geological survey of a 15 by 30-minute quadrangle (400 square miles) on the north coast of Georgian bay near Killarney. The area is situated on the borders of two geological sub-provinces and the study of the field has yielded results of great importance both as relates to matters of general geological interest and to the mode of occurrence of various classes of mineral deposits. Within the area are important deposits of feldspar, garnet, and other substances, which are of unusual potential importance owing to their proximity to the Great Lakes and easy transportation to Canadian and United States ports. A brief account of these deposits is given in the Summary Report, 1924, Part C. A fuller report is deferred until more field work can be done.

M. E. Wilson continued a detailed geological survey of an area near Madoc, which is mineralized with talc, fluorite, pyrite, arsenic, gold, etc., and is also of much importance from the standpoint of general geological understanding of the Canadian Shield. Maps on a scale of 1 inch to 1 mile, and a memoir, are in course of preparation.

Quebec

H. C. Cooke made a geographical and geological exploration of the country near Bell river, north of the Canadian National railway in the west. The area explored is part of a region in which valuable deposits of gold and copper ores have recently been found and in which prospecting is being actively conducted. The results of Mr. Cooke's field work are being embodied in a general report upon the region, which will be accompanied by two geological maps on a scale of 1 inch to 8 miles and representing a total area of 125,000 square miles.

W. F. James and J. B. Mawdsley jointly continued the detailed examination of the important gold and copper-bearing district of the western region commonly referred to as the "Rouyn, or Northwestern Quebec, gold field." During the past season the study of the Clericy and Kinojevis map-areas was completed and a full report on these areas, with geological maps on a scale of 1 inch to 1 mile, are being published in the Summary Report, 1924, Part C.

G. W. Bain made a geological reconnaissance over a large part of the eastern extension of the "Northwestern Quebec gold field." A geological map setting forth the results obtained is being published in the Summary Report, 1924, Part C.

R. W. Goranson made a detailed investigation of zinc ore deposits on Calumet island, Quebec.

F. J. Alcock continued the geological exploration of Gaspe peninsula. Part of the season was spent completing the geological mapping of the Mount Albert map-area. The rest of the season was spent in examining local areas in Lake Matapedia, Little Matane, Matane, and Cap-Chat rivers, in the vicinity of mount Logan and Serpentine mountain. The information obtained regarding these areas is incorporated in several reports to appear in the Summary Report, 1924, Part C.

Nova Scotia

F. A. Kerr made a detailed geological examination of the Springhill coal basin and vicinity. A memoir and a geological map on a scale of 1 inch to 1 mile are being prepared. Mr. Kerr also made a detailed examination of arsenic-bearing deposits at Moose River mines. The information obtained will be incorporated in the forthcoming report by M. E. Hurst on arsenic-bearing occurrences in Canada.

E. R. Faribault continued the systematic geological survey of the province. This survey has been in progress for many years and a series of sheets of uniform size on a scale of 1 inch to 1 mile have already been issued for all except the southwestern end. This year Mr. Faribault finished the Annapolis Royal sheet (No. 120) and commenced the Clementsport sheet (No. 119).

L. J. Weeks made a detailed investigation of a deposit of lead-zinc ore at Sterling, Cape Breton island.

A. Anrep surveyed and measured the contents of thirty peat bogs in Guysborough county, Nova Scotia. All save one of these bogs may be considered as a source of peat litter. A full account of the results of the work will be contained in the Summary Report, 1924, Part C.

TOPOGRAPHICAL DIVISION

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

FIELD WORK

Topographical and geographical surveys were carried on during the field season in British Columbia, Alberta, Manitoba, Ontario, Quebec, New Brunswick, and Nova Scotia. In every case the surveys were for the requirements of the Geological Survey.

British Columbia

A. C. T. Sheppard carried out the phototopographical surveys necessary for the completion of a 15 by 30-minute quadrangle in West Kootenay, lying between latitudes 49° 45′ and 50° 00′ and longitudes 117° 00′ and 117° 30′. The total area is 386 square miles and includes New Denver, Silverton, Slocan City, and Sandon. The scale of work was 3,000 feet to 1 inch, with a contour interval of 200 feet.

A secondary triangulation control was carried down Kootenay valley and connected to the International Boundary line, 49th parallel. Connexion was also made to the astronomical station at Proctor.

In all, forty-eight stations were permanently marked on the ground and the positions of these in latitude and longitude determined. These marks are to serve as a base for future geological work in the valley and for the use of the provincial government in their work. A complete list of these stations, with their descriptions and geographic positions, has been furnished to the Surveyor General of British Columbia and the topographical maps are being prepared.

J. A. Macdonald, junior topographical engineer, was attached to Mr. Sheppard's party.

D. A. Nichols topographically surveyed a 15-minute quadrangle (190 square miles) at Kamloops, lying between latitudes 50° 30′ and 50° 45′, and longitudes 120° 15′ to 120° 30′. This area was mapped on the scale of 3,000 feet to 1 inch, with a contour interval of 100 feet. Plane-table methods were used, controlled by triangulation. Besides the town of Kamloops, it contains mineral properties and physiographic features of interest.

Alberta

W. H. Miller continued the topographical mapping of the coal basins south and southeast of Mountain Park. In all, about 210 square miles were covered this year, and, together with the work carried out in 1921, an area of 360 square miles, lying between latitudes 52° 45′ and 53° 00′, and longitudes 117° 00′ and 117° 30′, is completed. About 90 square miles to the east and adjoining this area were also mapped.

J. W. Spence, junior topographical engineer, was attached to Mr. Miller's party.

Manitoba

R. C. McDonald made geographical control surveys for geographical and geological work of a northern area lying between latitudes 54° 00′ and 56° 00′, and longitudes 93° 00′ and 96° 00′. Approximately 1,100 miles of shoreline was mapped, based on a transit and micrometer traverse 590 miles in length. On account of the remoteness of the district and by reason of several small, crooked streams that lie along the route surveyed, the mileage was not as large as in previous years. A portable radio receiving set was used for obtaining correct time, and many astronomical observations were taken. The position of Oxford House was determined in latitude and longitude by astronomic observations. One hundred and forty permanent posts were established along the route to serve as control for future work.

Ontario

E. E. Freeland carried on geographical surveys in the vicinity of French river. He also carried a transit and tape traverse along the Canadian Pacific railway from the astronomic station at Pickerel to a point beyond Paget station. This traverse is for the control of the geographic surveys. All this work was carried out in connexion with the geological investigations in the area.

Quebec

R. Bartlett made a transit and stadia control traverse up Eastmain river. This traverse, which started at the mouth of the river, was carried to a point about 200 miles upstream. Five hundred and seventy-five miles of shoreline was mapped by means of a transit-stadia traverse 340 miles long, of which about 50 miles is rough water and rapids. Sixty-three permanent reference posts for future work were established. A new route over part of the course was surveyed and much information relative to side routes was obtained.

New Brunswick

A. G. Haultain completed the topographical mapping, on a scale of 3,000 feet to 1 inch with contour interval of 50 feet, of the Chipman quadrangle. This area of 207 square miles, which includes part of Minto coal basin, lies between latitudes 46° 00′ and 46° 15′ and longitudes 65° 45′ and 66° 00′. He continued, also, the topographical surveying, started in 1921 but not completed, of a quadrangle between latitudes 45° 45′ and 46° 00′, and longitudes 64° 45′ and 65° 00′. A little more work is required on this sheet in order to complete it.

Nova Scotia

K. G. Chipman commenced systematic topographical surveying in the southwest. The work was started in the vicinity of Aylesford and carried down Annapolis valley. Good progress was made and four 15-minute sheets were completed. The Geological Survey has conducted surveys for many years in this part of the province, with the result that a great amount of information has been obtained. The systematic topographical work, now in progress, is a continuation of these activities and is for the purpose of revising and correlating the various phases of this past work for publication in the modern standard map-sheet form.

J. V. Butterworth, junior topographic engineer, was attached to Mr. Chipman's party.

S. C. McLean continued the primary control traverse of the southwest. The work this year was carried along the Dominion Atlantic railway from Clementsport to Meteghan. Connexion by triangulation was made to the

geodetic triangulation station "Little River". Along the Halifax and Southwestern railway the work was extended from Dalhousie siding to Bridgewater and to Caledonia. From Cherryfield, on the Caledonia branch, a traverse was carried to Aylesford, via the Cherryfield-Dalhousie and Dalhousie-Aylesworth roads. From Caledonia, a traverse was carried to Annapolis Royal, via the Liverpool-Annapolis road. The total length of the traverses is about 190 miles.

Throughout this work, points permanently marked on the ground by iron posts or brass plugs in concrete were established every 2 or 3 miles. In all seventy-five points were established. In addition to setting these points, other features were tied to the survey wherever possible; these include five precise level benchmarks of the Geodetic Survey, twenty timber and land corner posts, five county line crossings, or posts, and a number of churches and lighthouses.

Using the North American datum as a basis, the accurate positions of all the above-mentioned points are determined. These positions, together with descriptions and other information, are supplied to the government of the province, to the larger timber companies operating in the area, to the railway companies, and others interested. The results are available to anyone on request to this department.

H. N. Spence, junior topographical engineer, was attached to this party.

OFFICE WORK

The chiefs of parties, on their return to the office from the field, carried on in the regular way the work of assembling, computing necessary data, compiling and drawing up in ink the finished manuscript map of the territory surveyed. The finished maps, together with necessary guide sheets showing names, etc., are then turned in for reproduction to the Supervisor of Map Preparation and Reproduction.

D. A. Nichols, who also carries on physiographic work, prepared for teaching purposes in various universities two hundred lantern slides illustrating the physical features of Canada, selected twenty lantern slides for addition to the library collection, and selected eighty new views and added them to the Atlas of Topographic Forms. Mr. Nichols also examined numerous photographic negatives for suitable illustrations, and prepared a list of illustrations of Canadian physiographic forms and sent copies to the leading Canadian universities.

MINERALOGICAL DIVISION

Eugene Poitevin, Chief of the Division, reports:

FIELD WORK

H. V. Ellsworth spent about two months of the summer in Ontario and Nova Scotia continuing his investigations of the rare element mineral occurrences. While in Nova Scotia he visited the Malagash salt deposit. More extended reference to his work is made below.

A. T. McKinnon, mineral collector, visited a number of localities in New Brunswick and Nova Scotia between July 7 and August 11, and collected 11,720 pounds of mineral specimens for the preparation of educational collections.

LABORATORY AND OFFICE WORK

During the year the staff of the division answered a large number of personal inquiries from many parts of Canada regarding minerals and ores or the mineral industry in general; this occupied about 10 per cent of the working time of the staff. As in the past, specimens that could be reported

upon without elaborate chemical or optical examination were investigated by members of the Geological Division; but even with this helpful arrangement over six hundred specimens were determined and reported upon in five hundred and nineteen memoranda which were sent as follows:

Nova Scotia	76	New Brunswick	38	Quebec	110
Ontario	139	Manitoba	25	Saskatchewan	32
Alberta	19	British Columbia	77	North West Territories	3

These examinations were made by Eugene Poitevin and H. V. Ellsworth. In addition, Mr. Poitevin made numerous mineral investigations for geologists and mining engineers of the staffs of the Geological Survey and Mines Branch. He has also been engaged in the supervision of the Museum work carried on during the winter by Dr. W. F. Ferrier.

H. V. Ellsworth continued his laboratory work on the rare minerals and prepared a report on the Malagash, Nova Scotia, salt deposit, in addition to contributing to the general work of the division. This report, entitled "Chemistry of the Potash-bearing Horizon of the Malagash Salt Deposit," will appear in Summary Report, 1924, Part C.

It might also be mentioned that the writer and H. V. Ellsworth have examined a fairly large number of the old Museum specimens which were being placed in the systematic collection and which needed either further examination or identification.

M. F. Connor, rock analyst, completed the following chemical analyses: composite sample, collected by W. H. Collins, of diamond-drill cores from one of the borings in the Helen siderite deposit, near Michipicoten Harbour, Ontario, fifty-three determinations. Diabase, collected by W. H. Collins, from Helen mine, Michipicoten district, fifteen determinations. Kaolin sample collected by W. H. Collins, from Helen mine, Michipicoten district, Ont., ten determinations.

MUSEUM WORK

Economic exhibits of coal, talc, asbestos, oil and tar sands, clays, feldspars, and salts, which were located at 227 Sparks street, were enlarged, rearranged, and transferred to the Victoria Memorial Museum. The Division of Mineralogy is indebted to the following gentlemen for their kind assistance in arranging these exhibits: B. R. MacKay, the late Jos. Keele, M. E. Wilson, W. A. Johnston, G. S. Hume, J. B. Mawdsley, of the Geological Survey, and S. C. Ells, H. Frechette, and L. H. Cole, of the Mines Branch.

One unit of this mineral exhibit (coal and its products) is the subject of a paper by B. R. MacKay in the Canadian Mining Journal[1]. It is expected that others of this series of exhibits of the economic minerals of Canada and their products will be assembled for display.

The systematic collection of Canadian and foreign minerals—many of the Canadian species were collected during Sir William Logan's time—has, because of lack of accommodation and an insufficient staff, been packed in boxes and has not been accessible to the public since 1910, when the Geological Survey was moved from its former quarters on Sussex street. The collection had also suffered considerably by repeated removal from one place to another, especially during the hurried move in 1915 from the Victoria Memorial Museum to the present quarters on Sparks street. This valuable collection, many specimens in which are irreplaceable, was in urgent need of care. Fortunately the assistance of Dr. W. F. Ferrier, well known as an expert in museum work and mineralogy, was obtained for six months, commencing in December, 1924. The work was of a detailed and arduous description necessitating the assembling of about 20,000 specimens. Dr. Ferrier's services were only temporarily secured, but as there is still a large amount of work to be done it is hoped that provision can be made for its continuance next year.

[1] MacKay, B. R., Can. Min. Jour., Feb. 27, 1925, vol. XLVI, No. 9.

A special museum table case has been designed in this office, and a sample case is now being made under the direction of D. A. Esdale, chief mechanic. It is to be hoped that before long a complete systematic collection will be on display in the Victoria Memorial Museum.

Accessions

Donations

Dufrenite and cacoxenite; sarcopside, Deering, N.H., from Prof. E. F. Holden, University of Michigan, Ann Arbor, Michigan.

Telluride ore, Hollinger Consolidated Gold Mines Ltd., Timmins, Ont.

Exchanges

Two specimens of serendibite from lake George, New York; vonsenite, from Riverside, Cal.; williamsite from Lime chrome pit, Md.; gearksutite from Wagon Wheel Gap, Colo.; creedite, creedite in kaolinite, Wagon Wheel Gap, Colo.; cristobalite, from Wassuk Range, Nevada; powellite crystals from Tonopah, Nev.; pachnolite, cryolite altering to pachnolite, prosopite, and ralstonite from St. Peters Dome, Pikes Peak, Colo.; foshagite, from Crestmore, Cal.; cebollite, from Beaver creek, Colo.; sheridanite, from near Miles City, Mont.; natrojarosite, from near Luning, Nev.; jarosite, from Pioche, Nev.; plumbojarosite, from Cerro Gordo, Cal.; series of minerals from Crestmore, Cal.; patronite from Minasragra, Peru; quisqueite, hewettite, pascoite, from Minasragra, Peru; orientite, from Oriente province, Cuba; lithiophyllite dickinsonite, damourite, autunite, margarodite, from Branchville, Conn.; hancockite, zincite-franklinite, from Franklin, N.J.; zaratite on chromite, from Lancaster co., Pa.; picrolite, from Brewster, N.Y.

Purchased

Two specimens of ruby silver from Castle mine, Ont.

EDUCATIONAL COLLECTIONS

A. T. McKinnon, in charge of this section, reports that during the fiscal year 111 collections containing 3,000 specimens were distributed as follows:

Province	Standard	Grade II	Grade III	Miscellaneous	Mineral chips	Prospectors
British Columbia	1	.....	1	.....	1	3
Alberta	.....	1	1	.....	1	1
Manitoba	.....	.....	.....	1	.....	1
Ontario	2	1	20	14	.....	25
Quebec	5	1	4	4	4	3
New Brunswick	.....	.....	.....	.....	.....	1
Foreign	.....	.....	.....	15	.....	.....
	8	3	26	34	6	34

Total..... 111

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

PALÆONTOLOGICAL DIVISION

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

FIELD WORK

W. A. Bell studied a belt of rocks 65 miles long and 5 to 15 miles wide in Nova Scotia, south of Northumberland strait, between the Pictou-Antigonish county-line and Wallace river. The twofold object of this study was to determine whether coal occurs between Pictou and Springhill, and the inter-relation of the geological structure and stratigraphy. A report upon this work is made in the Summary Report, 1924, Part C. Mr. Bell's collections have also added materially to the Coal Measures plant collections of the Survey.

E. M. Kindle studied the unique occurrence of a Devonian limestone fauna which is found in the islands of St. Lawrence river at Montreal, in the midst of a volcanic breccia. He also studied the section exposed by the construction of the New Welland canal in Niagara peninsula and made a good collection of corals and other fossils from the Onondaga limestones through which the southern part of the canal is being cut. Access to the bedrocks of Niagara peninsula afforded by this great excavation makes possible a clearer interpretation of the succession of geological events in this region.

Miss A. E. Wilson spent several weeks in southern Ontario collecting Ordovician, Silurian, and Devonian fossils, which are to be used in the High School collections sent out by the Survey.

F. H. McLearn was engaged throughout the year in laboratory and office work.

C. M. Sternberg collected fossil vertebrates from the Edmonton formation of the Red Deer valley, Alberta, during the summer. The resulting collection includes nine specimens which may be provisionally listed as follows: (1) Ornithomimus; (2) armoured dinosaur (n. sp.); (3) horned dinosaur; (4) *Edmontosaurus* sp.; (5) *Basilemys;* (6) *Anchiceratops* sp.; (7) *Thespesius* sp.; (8) elephant tooth; (9) *Anchiceratops ornatus;* (10) three species of fossil plants.

OFFICE WORK

Forty-eight collections of fossils, constituting part of the grade III educational collections sold to schools, were made up during the year.

A large number of collections have been studied and reported on for members of the staff. Among these the collection of J. F. Walker is notable for the large quantity of material and the general excellence of the collection which includes the first Devonian faunule found west of the upper Columbia River valley in British Columbia, and a large graptolite fauna.

Assistance was given in reading the proof of the Bibliographic Index of Canadian Fossils which, it is expected, will be published in the autumn.

F. H. McLearn studied and reported upon the Cretaceous fossils of Blairmore, Alberta, and adjacent areas, collected by himself in 1914 and 1915. He also prepared for publication a paper on the Coloradoan fossils from Peace and Smoky rivers, collected in 1917 and 1918. This report includes descriptions of new species, an account of the succession of faunas, and notes on correlation. Some progress was also made in the study of the Jurassic fossils of Skidegate inlet, collected in 1921. Small collections from the Hazelton series of British Columbia, gathered by G. Hanson and J. R. Marshall, were also examined in some detail; six new species have been described and an ammonite specimen is now being studied by means of which it is hoped to date a part of the Hazelton series very accurately.

Papers describing the new Ordovician and Devonian fossils from the Rocky mountains have been prepared and published during the year by Miss A. E. Wilson and E. M. Kindle (*See* list of papers elsewhere in annual report). The office work of W. A. Bell has included reports on a collection of Kootenay plants and a collection of Eocene plants, for members of the staff.

Miss M. A. Fritz was engaged during the summer in rearranging the old reference collections of the Survey.

Jos. Skillen and S. K. McDonald have been engaged throughout the year in preparing dinosaur material for exhibition.

EXHIBITS

Additions to the Museum exhibits made during the year include a very well-preserved skull of the large carnivorous dinosaur *Gorgosaurus*. A map prepared by A. Miles suggesting the geography and life of western Canada in Upper Cretaceous times, in the graphic manner of the renaissance map-makers, has been added to the dinosaur exhibit. A case of Euripterids and some other additions have been made to the exhibit of invertebrate collections during the year. A series of sections to scale have been prepared by Miss A. E. Wilson, representing Cape Breton, Ontario, Manitoba, and Alberta, which illustrate the use of fossils in correlating formations.

ACCESSIONS OF SPECIMENS

Dr. Charles D. Walcott, Secretary of the Smithsonian Institution, presented to the Survey a valuable collection of Middle Cambrian sponges and algæ from the Burgess shale of British Columbia. Mr. John Middlebrook presented a small but interesting collection of Hamilton fossils illustrating symbiosus. The Geological Survey has received from Mr. and Mrs. Hoyes Lloyd a collection of recent marine shells from the Gulf Coast of Florida. The Survey is also indebted to Dr. Mark McIlhinney for a clavicle and some of the vertebræ of a whale from the Pleistocene sand-pits at Rideau Junction, Ontario. Fossils collected by J. D. Soper from the Devonian and older rocks at Beechey island, Arctic archipelago, have been transmitted to this division, together with a mammoth tusk from Melville island, which was collected by the Canadian Arctic Expedition.[1] The Van Vel Chemical Company of Waldeck, Saskatchewan, presented a small collection of fossils from a bed overlying volcanic ash, Waldeck, Sask. A good collection of the fossil wood from the Ganado Petrified Forest, Arizona, was presented by Albert B. Reagan.

An exchange arranged with the Carnegie Museum of Pittsburgh has secured for the palæontological exhibits a slab mount of the early Miocene camel (*Oxydoctylus brachyodontus*) from the Tertiary rocks of Nebraska.

Three good specimens of euripterids from the Bertie waterlime were purchased, together with some other fossils, from E. Reinhard.

BORINGS DIVISION

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

The Borings Division of the Geological Survey accumulates records of borings made in any part of Canada in order that the information of a general geological character thus rendered available may be studied to arrive at a fuller understanding of the strata in depth, and thus be of further benefit to operators.

In Nova Scotia some core drill borings to test mineral deposits are made in various parts of the province. These are described in the reports of the Provincial Department of Mines.

[1] *See* Amer. Jour. Sci., vol. 8, 1924. pp. 183-185, figs. 1-3.

Thanks are due to the New Brunswick Gas and Oil Company for their continued co-operation in the Moncton gas and oil field of New Brunswick. For many years logs and sets of samples from all their borings have been received from them and through them from the borings put down by their affiliated company, the D'Arcy Exploration Company, since the cessation of the latter's activities. The campaign of boring carried on by these companies was directed by their own geological staff and the records consequently represent the interpretations of scientifically trained observers. There exists, therefore, in the files of the Borings Division, a large accumulation of valuable records with corroborative sets of samples illustrative of the geology of this district to depths of 2,000 to 4,000 feet.

From the province of Quebec no records of, or samples from, deep borings were received. In past years search for oil or gas was from time to time prosecuted by boring, and records and sets of samples were received. For several years, however, interest in the possibilities of the undisturbed Palæozoic of the Eastern Townships as possible carriers of petroleum and natural gas has subsided.

The work of collecting information regarding boring operations in the southwestern peninsula of Ontario has been carried on for the past few years through the co-operation of Col. R. B. Harkness, the Provincial Government Commissioner of Gas, to whom thanks are due for records and samples received. Apart from the logs of wells received through the Commissioner of Gas, as mentioned above, direct communication was maintained with operators at points where, owing to the situation of the boring, geological information of especial value might result. Owing to the near exhaustion of the pools of natural gas and of petroleum in the peninsula of Ontario, boring operations during 1924 were slight as compared with the activities in this respect in past years.

Thanks to the co-operation of the Wallace Bell Company of Montreal, samples were received from a boring put down in the yard of the Central Station at Ottawa, for the purpose of obtaining a supply of cool water. This started in the top of the Trenton and was carried to a depth of 1,090 feet. It was interesting as corroborating the geological section for Ottawa as established by the logs of other wells at various points in the city and vicinity. A number of wells have been put down in the city limits with very varying success in obtaining the considerable supplies of water desired. This variability in the results obtained seems to be due to the fact that no definite water-bearing horizon exists in the series of strata underlying the site of Ottawa city. Thus the attainment of a water supply of considerable volume would depend on the chance of encountering some open fissure system in the rocks of such extension as to ensure drawing a supply from a large area.

In the Prairie Provinces and the North West Territories some one hundred and eighty-five records were received from deep borings and sets of samples were received from twenty-three wells. Most of these records are located in southern and middle Alberta. The balance presents scattered borings in Alberta and some located at points along the Peace River valley and in the vicinity of McMurray and Norman in the North West Territories, together with records from two borings which commenced in the Cretaceous close to its eastern escarpment in Manitoba and northern Saskatchewan.

The data of general geological significance accumulated year by year as a result of the activities of the Borings Division provide a constantly widening basis of information enabling the division to render aid to operators on demand. The files of the division are also available for consultation in connexion with any geological investigations which may be contemplated or are in course of prosecution. Such investigations are being carried on by two parties for the Geological Survey in southern Alberta. The study of the results of the borings situated in the Sweet Grass, Foremost, Pakowki Lake, Barnwell, Medicine Hat,

Many Island, and Willow Creek groups thus fall within the scope of those parties under the direction of M. Y. Williams and E. J. Whittaker. Similarly the work prosecuted by G. S. Hume in the Irma-Wainwright field included the collection and study of the results of borings in that group.

Especial efforts were made to secure sets of samples from the three wells situated along the northward extension of the eastern edge of the Cretaceous. These wells are of especial interest as adding to the knowledge of the Cretaceous and underlying Palæozoic resulting from the chain of borings made in past years along the southerly extension of this escarpment. This series of well records gives an interesting geological section beginning in the Benton shales and extending down through the basal Dakota sandstone for some depth into the underlying limestones, etc., of Devonian age. Owing to the previous acquirement of a very complete set of samples from the boring at Winnipegosis put down by the Manitoba Government in 1921-22, the Palæozoic section was completed down to the old Precambrian sea bottom.

Apart from records accumulated which were made out by the drillers or field geologists of the various companies, over 2,576 samples of drill cuttings were received from operators in the northwest during the year. As in the past, these were recorded and systematically filed away so as to be available for examination in connexion with geological studies in the future. Where need arose and time permitted, the series of cuttings from certain wells have been intensively studied by laboratory methods and the results placed at the disposal of the geologists in charge of the field work, or of the operators. This intensive study by microscopic and chemical methods of the cuttings from the sedimentary strata is necessarily tedious and time consuming and so can only be undertaken for specially selected wells. Furthermore, this research constituting a comparatively new branch of geological science, much time is consumed in working out methods experimentally.

With regard to that part of Canada comprised within the province of British Columbia and the Yukon Territory, deep-boring operations were not extensively prosecuted and but little information was reported to the division. Diamond-drill borings intended to ascertain the extent of ore reserves in metalliferous mines were doubtless prosecuted in the various mining camps, but these do not come within the scope of the Borings Division. The deep borings in search of gas and oil in the Fraser River delta deposits were not active, except that of the Empire Oil and Gas Company on N.E. sec. 27, tp. 10, R.E.C.M., which was reported to have attained a depth of about 5,500 feet. The Empire Oil and Gas Company have, however, adopted the policy of reserving all information for their own use and so no reports or sets of samples have been acquired by the Borings Division.

The only deep borings in British Columbia from which samples, etc., were received, was that of the Crow's Nest Oil and Gas Company, on Sage creek in the valley of Flathead river, East Kootenay. Their operations this year were in continuation of the boring test for petroleum begun some ten years ago. The belief that oil would be got in commercial quantities in depth was based on the occurrence of seepages of oil at the surface. During 1924, twenty-seven samples of cuttings were received from this well, from between depths of 2,500 feet and 3,000 feet. The strata pierced belong to the Lewis series, as described in Memoir 38. This series of strata was classed by Daly as pre-Devonian. The samples of drill cuttings were examined microscopically and the material compared with Daly's descriptions of the strata. They were also treated with hydrochloric acid and the proportion of insoluble residue measured. This, together with the observed character of the effervescence, gave further means of correlation. The material received did not show any marked variations in appearance, but below 1,640 feet the acid test indicated a decided increase in the proportion of car-

bonates (lime, magnesium, etc.). This change of character occurs at about the point where it was expected the hole would leave the Appekunny and pass into the more calcareous and dolomitic Altyn below, thus corroborating, in a general way, the correlation with Daly's geological section.

The table given below gives particulars of samples and records received in 1924:

	Number of samples received	Number of wells from which samples were received	Number of records received
Maritime Provinces	3,041	13	40
Quebec	31	2	3
Ontario	2,240	32	10
Northwest Provinces	2,576	23	185
British Columbia	28	1	3
Total	7,916	71	241

GEOGRAPHICAL AND DRAUGHTING DIVISION

C.-Omer Senécal, Chief of the Division, reports:

Twenty-three new maps were completed and issued; seven are at present in the hands of the King's Printer for lithographing and printing; the engraving on four maps requiring nine copper plates has been executed in this division; and ten other maps are also at various stages of progress.

The compilation has been resumed of the general map of western Quebec on the scale of 1 inch to 8 miles, referred to in last year's report, embodying geological investigation to date in an area of about 100,000 square miles, and parts of the map were completed for engraving.

A map of similar character covering the southern part of the province of Alberta is under way; photocopies of the geographical features of this map will shortly be available to the geologist for the coming field season.

The detailed maps of Blind River, Bruce Mines, and Lake Panache areas, Ontario, on the scale of 1 inch to 2 miles, which had been held over pending further field investigation, have been sent out for lithographing and printing; proofs have already been submitted and the editions are expected at an early date.

The compilation work of the Nova Scotia series of geological sheets, on the scale of 1 inch to 1 mile, which heretofore was carried out in this division under the personal guidance of the geologist in charge, has, by order of the Director, May 27, 1924, been transferred to the Topographical Division. At that date, 25 serial sheets of Lunenberg and Queens counties, laid out in sets on large manuscript sheets, were at various stages; several sheets were practically finished and required only final revision of the topography, before the geological drafts, including legends and sections, could be prepared.

About 150 zinc-cut, photolith, and miscellaneous drawings of sketch maps, text figures, diagrams, etc., were executed for the illustration of memoirs and reports and for sundry purposes. The time of a draughtsman was also, for more than a month, occupied in the drawing of signs and labels for a coal exhibit in the entrance hall of the Museum.

The cataloguing of field books, plans, and other survey records is progressing as time permits during summer months.

In May, 1924, the Chief of the Division was requested by the Deputy Minister on behalf of the Civil Service Commission to prepare a set of special test papers for an examination of candidates to a position of map draughtsman in the Natural Resources Intelligence Service of the Department of the Interior. The papers were duly prepared, and the candidates' answers subsequently rated and reported upon. Duties of the Chief of the Division, on the Executive Committee of the Geographic Board of Canada, were, as usual, attended to.

A list of maps in progress at the Printing Bureau, on March 31, 1925, and a list of maps published during the fiscal year, are given below:

Maps in Hands of King's Printer, March 31, 1925

Publication number	Title	Date of requisition	Remarks
1969	Bruce Mines area, Algoma district, Ontario; scale, 1 inch to 2 miles	Dec. 6, 1924	Geology
1970	Blind River area, Algoma district, Ontario; scale, 1 inch to 2 miles	" 6, 1924	"
1971	Lake Panache area, Sudbury district, Ontario; scale, 1 inch to 2 miles	" 6, 1924	"
1994	Flinflon Lake area, Saskatchewan and Manitoba; scale 1 inch to ½ mile	Jan. 20, 1925	"
2040	Driftwood Creek sheet (west half) Coast district, British Columbia; scale, 1 inch to 1 mile	Feb. 19, 1925	Topography
2043	Heffley sheet (North Thompson valley), Kamloops district, British Columbia; scale, 1 inch to 1 mile	" 24, 1925	"
2048	Driftwood Creek sheet (west half) Coast district, British Columbia; scale, 1 inch to 1 mile	Mar. 6, 1925	Geology and topography

Maps Published April 1, 1924, to March 31, 1925

Publication number	Title	Remarks
	GENERAL	
1277	Geological map of the Dominion of Canada and Newfoundland; scale, 1 inch to 100 miles	Geology, 3rd edition, revised by G. A. Young
2030	Mineral map of the Dominion of Canada; scale, 1 inch to 100 miles	Index to economic minerals, by G. A. Young
	MACKENZIE DISTRICT	
2022	Mackenzie river, between Wrigley and Norman; scale, 1 inch to 8 miles	Geology. In report by G. S. Hume, Part B, Summary Report, 1923
	BRITISH COLUMBIA	
1988	Coquihalla River area, Vancouver island; scale, 1 inch to 1 mile	Geology. In Memoir 139, by C. E. Cairnes
2017	Courtenay sheet, Vancouver island; scale, 1 inch to 1 mile	Topography
2023	Reconnaissance map of portions of the drainage areas of Silver creek, Skagit river, and Similkameen river, Yale district; scale, 1 inch to 2 miles	Geology. In report by C. E. Cairnes, part A, Summary Report, 1923
2038	Kokanee Glacier park, Kootenay district; scale, 1 inch to ½ mile	Topography

Maps Published April 1, 1924, to March 31, 1925—*Continued*

Publication number	Title	Remarks
	ALBERTA	
1993	Cadomin sheet, townships 46-49, ranges 23-24, west of 5th meridian; scale, 1 inch to 1 mile	Topography
	MANITOBA	
1995	Cross and Pipestone Lakes area; scale, 1 inch to 2 miles	Geology. In report by F. J. Alcock, part D, Summary Report, 1919
2012	Beresford Lake area, Rice Lake mining district; scale, 1 inch to 1 mile	Geology. In report by J. F. Wright, part B, Summary Report, 1923
	ONTARIO	
1902	Thunder cape, lake Superior; scale, 1 inch to 3,000 feet	Geology
2020	Thunder Cape sheet, Thunder Bay district; scale, 1 inch to 1 mile	Topography
2021	Fort William and Port Arthur sheet, Thunder Bay district; scale, 1 inch to 1 mile	Topography
	QUEBEC	
2036	Preliminary map of Rouyn area, Témiscamingue county; scale, 1 inch to 1 mile	Geology. In report by W. F. James, part C, Summary Report, 1923
2039	Preliminary map of Dufresnoy area, Abitibi and Témiscamingue counties; scale, 1 inch to 1 mile	Geology. In report by R. Harvie, part C, Summary Report, 1923
	NEW BRUNSWICK	
2024	Maugerville Peat Fuel bog, Sunbury county; scale, 1 inch to 2,400 feet	Economic geology. In report by A. Anrep, Part C, Summary Report, 1923
2025	Eel and Escuminac Peat Litter bog, Northumberland and Kent counties; scale, 1 inch to 1 mile	" "
2026	Shippigan Peat Litter bog, Gloucester county; scale, 1 inch to 2,400 feet	" "
2027	Pokemouche Peat Litter bog, Gloucester county; scale, 1 inch to 2,400 feet	" "
2028	Lamek Peat Litter bog, Shippigan island, Gloucester county; scale, 1 inch to 2,400 feet	" "
2029	Miscou Peat Fuel bog, Miscou island, Gloucester county; scale, 1 inch to 4,000 feet	" "
	NOVA SCOTIA	
1960	Vogler Cove serial sheet No. 90, Lunenburg county; scale, 1 inch to 1 mile	Geology
1981	Chester Basin serial sheet No. 87, Lunenburg county; scale, 1 inch to 1 mile	"

MAP ENGRAVING DIVISION

Robert Veitch, in charge, reports:

Standard Topographical Maps Completed

Springhill sheet, Cumberland and Colchester counties, Nova Scotia; scale, 1 inch to 1 mile. Three plates engraved.

Fort William and Port Arthur sheets, Thunder Bay district, Ontario; scale, 1 inch to 1 mile. Three plates engraved.

Mount Albert sheet, Gaspe county, Quebec; scale, 1 inch to 1 mile. Three plates engraved.
Kokanee Glacier park, Kootenay district, British Columbia; scale, 1 inch to ½ mile. Three plates engraved.
Driftwood Creek sheet (west half), Coast district, British Columbia; scale, 1 inch to 1 mile. Three plates engraved.
Heffley sheet (North Thompson valley), Kamloops district, British Columbia; scale, 1 inch to 1 mile. Three plates engraved.
Windermere sheet, Kootenay district, British Columbia; scale, 1 inch to 2 miles. Revision carried out on three plates.

Standard Topographical Maps in Progress

Projections have been engraved for the following sheets:
Slocan Lake sheet, British Columbia.
Kamloops sheet, British Columbia.
Keen Creek sheet, British Columbia.
Chipman sheet, Queens and Sunbury counties, New Brunswick.

New Nova Scotia Series

Projections engraved for five map-sheets of this series.

Geological Maps Completed

Mineral map of the Dominion of Canada; scale, 1 inch to 100 miles. Two plates engraved.
Driftwood Creek sheet (west half), Coast district, B.C.; scale, 1 inch to 1 mile. One plate engraved.

Other Work Completed

Engraving of projections and laying down of offsets necessary for the engraving of the following maps:
Topographical map, East Broughton sheet, Megantic, Beauce, and Frontenac counties, Quebec; scale, 1 inch to 1 mile. Projection and offsets for three plates.
Topographical map, Creston sheet, Kootenay district, British Columbia; scale, 1 inch to 1 mile. Projection and offsets for three plates.
Geological map, Barkerville area, Cariboo district, British Columbia; scale, 1 inch to 1 mile. Offsets for three plates.
Geological map, Mount Albert sheet, Gaspe county, Quebec; scale, 1 inch to 1 mile. Offsets for three plates.

Geographical Work in Progress

Two sheets of portions of Quebec; scale, 1 inch to 8 miles. Four plates in hand.

Geological Work in Progress

Standard Pattern Plate to represent metamorphism.

During the year the indexing of all Geological Survey engraved plates was completed. This index, in future, will result in a very material saving of time in expediting work.

PHOTOGRAPHIC DIVISION

G. G. Clarke, Chief of the Division, reports:

The following work was done during the year:

	Inches		Inches	Number
Contact prints	4 by 5	to 35	by 48	15,551
Bromide enlargements	4 by 5	to 40	by 72	654
Exposures developed	3¼ by 4¼	to 6½	by 8¼	4,974
Dry plate negatives	4 by 5	to 11	by 14	4,974
Wet plate negatives	8 by 10	to 24	by 30	246
Zinc plates	11 by 14	to 24	by 36	27
Photostat copies	7 by 11	to 11	by 14	370
Lantern slides			3½ by 4	1,133
Photos and titles mounted				1,141
Total				24,847

The Geological Survey collection of photographs now comprises nearly 60,000 negatives. These pictures have been accumulated by officers of the Survey chiefly during the last fifty years and are representative of all parts of Canada, and from the United States boundary to the Arctic ocean. They cover an extraordinary range of interesting subjects and many of the older ones have now acquired historical value as records of the progress and development of the country. In order to make this collection more available to the public a set of photographic prints, mounted and classified according to subjects, is being prepared and placed in the Geological Survey library. An arrangement has also been made whereby, as time permits, photographic prints, enlargements, and lantern slides will be made on request from persons outside the department at about the cost of preparation. Advance photographic copies of maps, photostat reproductions of pages from rare reports, and other work of the kind will also be done. This work for the public will be subordinated to the official photographic work for the Department of Mines, and will be executed in an amount dependent upon the resources of the Photographic Division.

A collection of photographs illustrative of physiographic forms in Canada, which was undertaken eight years ago, is being continued. This collection is of particular interest to Canadian universities and other institutions engaged in the study and teaching of physiography, as well as being of considerable popular interest. The collection is on view in the library of the Geological Survey and photographic prints, enlargements, or lantern slides of any of the photographs may be purchased.

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 persons making application in person, and is given also in the form of correspondence, memoranda, and published reports and maps. A considerable part of the technical correspondence of the Geological Survey is dealt with.

Articles were prepared during the year for publication in the Gazette, the Globe, the Canadian Mining Journal, and the Handbook of Canada prepared for the British Association for the Advancement of Science, which met in Canada in August, 1924. These articles dealt with such subjects as the importance of the mineral industry of Canada, the status of the industry, and the progress made. Numerous short articles were prepared for the use of the press and were well received. In this way the readers of the newspapers and mining and scientific journals were kept informed of the nature of the publications issued from time to time by the Survey.

The publications of the Geological Survey and of the Victoria Memorial Museum are distributed by this division. During the year 53,501 publications, exclusive of the French editions, were distributed. Of these, 12,766 were sent to addresses on the regular mailing lists, and 40,735 were distributed in compliance with written and personal requests for named publications, or requests for general or specific information.

BRITISH EMPIRE EXHIBITION

Mr. Malcolm was one of two members of the Department of Mines sent to the British Empire Exhibition for the purpose of imparting information regarding the mineral resources of Canada, interesting the British public in the possibilities for profitable investment in Canadian enterprises, studying market conditions, endeavouring to establish closer trade relations between Canada and

the mother country in minerals and mineral products, and giving general information regarding the country to prospective emigrants. The success of the work was contributed to in part by facilities accorded by the Office of the High Commissioner for Canada, and by the announcements given through that office to the press of the availability of technical officers of the Department of Mines for purposes of consultation. Mention should be made more particularly of the services in this connexion of Mr. P. M. Dearle, who has made himself remarkably conversant with Canadian affairs.

The mineral exhibit in the Canadian pavilion at Wembley lent opportunity for getting in touch with a great number of people from Great Britain and Ireland, the British dominions and colonies, and many foreign countries. A splendid collection of economic Canadian minerals was exhibited in a most attractive manner. Large specimens of ore from the operating mines and from deposits of promising economic value from the Atlantic to the Pacific were displayed in well-lighted cases. A more representative and more nearly complete collection of economic minerals has seldom or never been assembled by any country, and Mr. W. D. Dalglish, the member of the Exhibition Commission who had charge of this work, is to be complimented on its excellence.

The information sought by the public was of a wide and varied nature. Frequently it was of a very general character and had to do with the future of the mining industry of the country, involving such problems as the known reserves of minerals, likelihood of discovery of additional deposits, probable increase in industrial, chemical, and metallurgical activities not only in Canada but in the whole world, and the consequent increasing demand for the products of the mine and quarry. It has to do with the non-metallic as well as the metallic minerals. Frequent inquiries were received from mining men, students in mining schools, and metallurgists regarding the opportunities in Canada for men whose business it is to direct mining and metallurgical operations. Information was sought regarding special geological conditions having a bearing on the possibility of the occurrence of particular minerals such as placer gold, coal, and petroleum.

Buyers of minerals were given the names and addresses of producers, and the chances were discussed for extending the markets for Canadian products in England and elsewhere. Interviews were requested by men who had been approached with propositions for investment in particular mining claims, prospects, and ore deposits. To these it was pointed out that although there are excellent opportunities for the profitable investment of capital in Canadian mining by men who are conversant with the business and are in a position to employ the most competent technical advisers, and although Canada welcomes British capital thus intelligently directed, the chances of loss are sufficient to deter the investor from putting any considerable amount of money in a prospect except on the advice of a reputable mining engineer. The advantages of employing engineers acquainted with local geological conditions, with local mining operations, and with local mining problems in all their phases were emphasized.

It is not appropriate to enter here into a long discussion on the general purposes and results of the Exhibition. Perhaps no better scheme could have been conceived for the dissemination of knowledge regarding the resources of the British Empire and of acquainting the British people with the opportunities the dominions and colonies offer for investment and emigration. The Exhibition was made the occasion for the assembling of empire congresses and world conferences of men engaged in industrial and scientific pursuits and for great numbers of citizens of the British possessions to visit and become acquainted with the mother land and her people. Interchange of ideas has led to better understandings, mutual appreciation, and good-will; closer trade relations and increased interdependence should ensue. So far as Canada is directly

concerned the exhibit created the general impression that it is a country of great resources. Remarks to this effect were heard on every hand. Fixation of this impression in the minds of the British people must logically result in the directing of emigration to this country. It should also result in the diverting of capital to Canada. Capital follows in the wake of emigration and population begets capital.

LIBRARY

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

Additions to the library during the year 1924-25 include:

Books purchased	706
Volumes received as gifts or exchanges	608
Pamphlets	452
Maps	428
Books bound	175
Periodicals subscribed for	163
Periodicals received as exchange	342
Foreign government documents (not otherwise counted)	572
Canadian government documents (not otherwise counted)	76

The Geological Survey Library has recently received the publications of five new geological surveys, so that it has now practically complete series of one hundred and ten surveys of the world. Library of Congress cards for all surveys are filed in the Library, as well as their set of cards for current geological works. Much progress has been made in completing series of Transactions and Proceedings of foreign societies which had not been received since 1913.

The number of books borrowed during the year was 6,350. This does not include those consulted in the library by the 8,020 readers recorded. The catalogue was increased by 3,706 cards. Lantern slides from the geological collection were loaned to the number of 971, and 128 cards were added to the lantern slide catalogue. An unusually large number of maps were borrowed or consulted in the library. The collection of photographs has increased rapidly, necessitating a better system of cataloguing and filing, which will be carried out in the coming year. Photograph titles printed amounted to 1,380.

In addition to the current cataloguing, several important series have been completely analysed, i.e., the Geological Survey of Great Britain, of Ireland, of the States of Illinois and Indiana, and the Memoirs of the American Museum of Natural History.

The work of keeping the files complete by requests, claims, and acknowledgments amounted to 364 pieces of correspondence, for which suitable cards and letter forms are provided, thus saving much time. The regular correspondence having to do largely with reference work, loans, and bibliography, involved a considerable amount of translating of foreign languages.

In the preparation of supplements to the "Union lists of periodicals in Ottawa libraries" we co-operated by furnishing 228 additional entries of periodicals in our files. The current year shows a marked increase in the lending of books to other institutions and in obtaining inter-library loans for members of the staff. This may be partly attributed to the publication by McGill University of the Catalogue of Scientific Periodicals in Canadian Libraries, a work in which the Survey Library co-operated. Our resources are also made known to the public by mimeographed lists of the more important accessions, mailed every three months to other libraries and institutions, and to scientific workers in all parts of Canada.

During the visit of the British Association to Ottawa, a number of distinguished geologists inspected the Library, and as a result of their interest several valuable publications have since been received, particularly from Dr. J. S. Flett, and Miss Mary S. Johnstone. Grateful acknowledgment is also made of gifts from the following: Comte de Montesus de Ballore, Mr. Charles

Camsell, Mr. William McInnes, Mr. D. Jenness, Mr. W. Malcolm, Prof. H. J. Rose, Mr. D. B. Dowling, Rev. Fr. Fontanel, Mr. F. Johansen, Mr. E. C. Jeffrey, Vignate Milciades Alejo, and from many societies and institutions.

Some notable acquisitions to the Library for the past year are the following:

Grand'Eury, F. C. Flore carbonifère du département de la Loire et Centre de la France. v. 1-3, 1877.
Lacroix, A. Minéralogie de Madagascar. 3 vols. 1922-23.
Neues jahrbuch für mineralogie, geologie und palaeontol. Beilage Band, v. 38-48, 1915-24.
Société paléontologique Suisse. Mémoires, v. 1-34, 1874-1902.
Palæontographia Italica, Memorie di paleontologia. Pisa. v. 1-27, 1895-1921.
Edinburgh University, Catalogue of printed books in the Library. 3 vols.
Buitenzorg Inst. of Sciences. Treubia, v. 1, 1919—date.
Norske Geografisk Selskab. Arbog, 2-4, 7-9, 11, 13-16, 19-22, 23-27, 1890-1916.
Archiv for Mathematik og Naturvidenskab. Christiania, v. 3-12, 1878-1888.
Zool.-botanische Gesellschaft. Vienna. Verhandlungen, v. 64-72, 1914-22. Abhandlungen, v. 8-15, 1914-24.
Copenhagen. Kgl. Danske Videnskabernes Selskab. Oversigt over Forhandlingar. 1844-1886.
Vienna. Akad. der Wissenschaften. Sitzungsberichte. v. 121-131, 1912-1923.
Botaniska Notiser. 1871-1922.
Rouy et Foucard. Flore de France. v. 1-14, 1893-1913.
Oeder, G. C. and others. Icones Plantarum. Floræ Danicæ. Fasc. 1-20, 1756-1797.
Baillon, H. E. Natural history of plants. v. 1-8, 1871-1888.
Ascherson and Graebner. Synopsis der Mittel Europaeischen Flora. v. 1-6, 1896-1910.
British Birds. v. 1-16, 1907-1923.
Physikalisch-ökonomische Gesellschaft zu Königsberg. Schriften. v. 54-60, 1913-1920.
Indian Museum Records. v. 1-7, 1907-1912.

BRITISH COLUMBIA OFFICE

V. Dolmage, in charge, reports:

On April 19, 1918, authority was obtained (P. C. 64/942) for the creation and maintenance in Vancouver of a branch office of the Geological Survey. By the end of September of that year four rooms, 509-512, in the Pacific building, corner of Hastings and Howe streets, had been rented and furnished and occupied by a staff consisting of a geologist in charge, an associate geologist, and a secretary.

This branch office was established to overcome in part the difficulty of keeping in touch from Ottawa with the developments and needs for geological information of the western part of Canada, and experience has demonstrated its usefulness. A stock of reports and maps supplied from Ottawa is kept for distribution, enabling request to be satisfied in ten days' less time than was formerly necessary. Much information is given by personal interview instead of by the slower and less effective method of correspondence. A selected library of reports, periodicals, and maps pertaining especially to western Canada is also maintained for public use.

The office is also advantageous to the Geological Survey in various ways. It facilitates intercourse with provincial government officials. It is an effective medium for keeping in touch with discoveries and developments in the mineral industry of western Canada. It also serves as a subsidiary headquarters for Geological Survey field parties working in British Columbia and Yukon, obviating considerable expense in the shipment of field equipment across the continent.

During the past year the British Columbia office was in charge of V. Dolmage, assisted by C. E. Cairnes, associate geologist, and A. J. C. Nettell, who has been secretary since the office was established, and whose knowledge of western Canada and experience in metallurgical and mining practice has greatly contributed to the usefulness of the office to the public.

During the fiscal year 1924-25, 3,000 callers were received at the office, who sought a wide range of information on mining subjects and to whom about 800 reports and 1,000 maps, including provincial issues, were distributed. In addition, some 400 inquiries were received by mail from Great Britain, the United States, and other points, to which replies and some 250 reports were forwarded.

VICTORIA MEMORIAL MUSEUM

L. L. Bolton, Acting Director

The outstanding event during the year, and the one that commands first mention, was the death, on March 10, 1925, of the Director, Dr. William McInnes. Dr. McInnes spent forty-four years in the service of Canada, and saw the Museum grow from a small institution to the position of importance that it now fills in educational and scientific circles. Appointed in 1882 to the staff of the Geological Survey, he had served successively as assistant geologist, as geologist, as directing geologist, and finally, from April, 1919, as Director. In 1920 he was given the newly-created position of Director, Victoria Memorial Museum, and Editor-in-Chief, Department of Mines, which dual office he held until his death. His duties as Editor-in-Chief of the department provided an opportunity for the exercise of his rare discrimination in the selection of the appropriate word and the use of the simple, clear, and refined English in which he excelled, and his work as Director of the Museum furnished a congenial field for one possessing as he did, a broad, kindly, and intelligent interest in natural history and subjects of cultural value.

It is a matter of regret to have to record the mysterious disappearance on or about September 20, 1924, of F. W. Waugh, assistant ethnologist, Division of Anthropology. Mr. Waugh, who had completed his summer field work at Seven Islands, Quebec, had planned to spend possibly a few days at the Caughnawaga Indian Reserve south of Montreal to secure information pertaining to certain studies in which he was engaged. From evidence secured it appears he visited the Reserve; but from that point onwards no trace has been secured of him; and in our inquiries we have had the co-operation of the Royal Canadian Mounted Police. Mr. Waugh joined the department in 1912 when the Division of Anthropology was being organized and his intelligent devotion, since he joined the staff, to the investigations in which he has been engaged, was of a character to win the admiration of those with whom he was associated.

The resignation of Miss C. A. McConnell was accepted effective March 1, 1925.

During the year the Halls of Biology, Anthropology, Palæontology, and the rotunda of the Museum were retinted; deflectors were placed on the heating coils to prevent the griming of the walls, and a number of benches were provided for the convenience of visitors. A large number of the exhibits of the Divisions of Anthropology and Biology were re-arranged, new exhibits were added where space permitted, and the group of exhibits now presents an improved appearance. Part of the rotunda facing the main entrance has been devoted to an exhibit of economic mineralogy prepared and arranged by the Geological Survey, in which the coal supply of Canada and the products of coal are featured and in which are included specimens of talc, asbestos, and magnesite, and the products made from them. Attention may here be drawn to the very inadequate amount of floor space available for exhibits in biology and palæontology.

On August 5, 1924, a party of overseas scientists, numbering about 250, visited the Museum on their way to Toronto to attend the 1924 Meeting of the British Association for the Advancement of Science. The various exhibits proved of exceptional interest to these visitors, many of whom availed themselves of the opportunity to meet the specialists of the Museum staff and to study the collections in which they were specially interested. The Museum also served as the headquarters for the annual convention of the Canadian

Institute of Mining and Metallurgy, held in Ottawa on March 4, 5, and 6. Upwards of two hundred members of the Institute attended the convention and in anticipation of their coming appropriate exhibits were prepared to portray the activities of the Museum in biology, anthropology, and palæontology

A committee, consisting of Dr. Duncan C. Scott, Deputy Superintendent General of Indian Affairs; Dr. Charles Camsell, Deputy Minister of Mines; Mr. J. B. Harkin, Commissioner of Canadian National Parks; and Mr. Edward Sapir and Mr. C. M. Barbeau, of the Museum staff; has been created to advise Government on the conservation of totem poles that still remain among the Indian tribes of our Pacific coast. A preliminary survey of the situation, recommended by the committee, was made by Mr. Barbeau last summer; arrangements have been made for a commencement of preservation work during the summer of 1925.

The course of free public lectures, on Saturday mornings for children and on Wednesday evenings for adults, was continued during the winter from December 6 to April 1, under the supervision of Mr. D. B. Dowling and Mr. Harlan I. Smith. The interest evinced in these in previous years was well maintained. The lecturers were provided from the staffs of the Departments of the Interior, Agriculture, and Mines and the lectures were illustrated by stereopticon views; and, through the courtesy of the Department of Trade and Commerce, by moving pictures. The following lectures were included in the course, both for adults and children:

Fur Bearers and Trapping, by Clyde L. Patch, December 6 and December 10, 1924.
Picturesque Nova Scotia, by F. H. Kitto, December 13 and December 17, 1924.
The Study of Birds, by Hoyes Lloyd, December 20 and December 24, 1924.
Bird Chums, by Harrison F. Lewis, December 27 and December 31, 1924.
The Story of a Lump of Coal, by D. B. Dowling, January 3 and January 7, 1925.
A Visit to Canadian Forts and Battle Fields, by Arthur A. Pinard, January 10 and January 14, 1925.
Insect Enemies of Our Forests, by J. M. Swaine, January 17 and January 21, 1925.
The Making of Honey, by C. B. Gooderham, January 24 and January 28, 1925.
British Columbia, by George Hanson, January 31 and February 4, 1925.
Our Neighbours—Yellow, Red, and Black, by Edward Sapir, February 7 and February 11, 1925.
The Basin of Lake Agassiz, by J. F. Wright, February 14 and February 18, 1925.
What the Forests Mean to Canada, by Roland D. Craig, February 21 and February 25, 1925.
The Fight Against the Insects, by Arthur Gibson, February 28 and March 4, 1925.
Canada's Unknown Playgrounds, by Fred. V. Seibert, March 7 and March 11, 1925.
Why Do We Hunt for Fossils? by Charles M. Sternberg, March 14 and March 18, 1925.
A Trip Through Southwestern Ontario, by W. J. Boulton, March 21 and March 25, 1925.
The Fight Against Forest Fires in Canada, by E. H. Finlayson, March 28 and April 1, 1925.

No record is kept over any period of the number of visitors to the exhibition halls of the Museum, but the number is evidently increasing from year to year. The Lecture Hall is in great demand by scientific, literary, and other societies, many calls being received for those evenings not taken up with the regular museum lectures.

The officers of the Anthropological and Biological Divisions, in addition to the work necessary for the upkeep and improvement of the exhibits in the public exhibition halls, have devoted their time to research work in their various fields. This is outlined in the reports from Mr. Sapir and Mr. Anderson, which follow.

The dispatch, under the direction of the Department of the Interior, of the Canadian Government steamer *Arctic* to the Arctic regions in July, 1924, offered an opportunity to send Mr. J. Dewey Soper, who has already worked in those regions, as naturalist to Baffin island on behalf of the Museum. The object of this trip is described by Mr. Anderson in his report.

Mr. Hamilton M. Laing, who, on behalf of the Museum, accompanied the Canadian Government mine-sweeper *Thiepval* on its trip last year from Victoria to Japan to assist the attempted round-the-world aeroplane flight of Major

Stuart MacLaren, reached home in August last, and the biological material and the information which he secured have well justified his engagement. The notes which he made are being published as Museum Bulletin No. 40.

The completed manuscript of "Birds of Western Canada", a companion volume to "Birds of Eastern Canada", by P. A. Taverner, first published in 1919, is now in the hands of the King's Printer. Important work has also been done during the year by Mr. Anderson on the reports of the Canadian Arctic Expedition, 1913-18. Many other papers have been prepared and published, mostly in scientific journals, by the members of the staff.

ANTHROPOLOGICAL DIVISION

ETHNOLOGY AND LINGUISTICS

Exhibits and Care of Material

E. Sapir, Chief of the Division, reports:

A number of the exhibits have been rearranged and new pedestals have been provided for the large standing exhibits. New group labels have been hung and case labels have been reduced to a standard form. The large Skidegate Haida totem-pole and a Bella Coola pole have been erected at the entrance to the Museum and several house-posts have been put up in the main anthropological hall.

Three special exhibits have been arranged during the year. One, for the meeting of the British Association for the Advancement of Science at Toronto, August, 1924, showed aboriginal art, aboriginal pottery, and aboriginal uses of copper. The second, arranged for the meeting in the Victoria Memorial Museum on March 4, 5, 6, 1925, of the Canadian Institute of Mining and Metallurgy, was designed to show the wide variety of minerals used by the Canadian aborigines; over fifty different minerals being represented. The third, arranged for the same meeting, was a loan exhibit of W. L. Kihn's remarkable series of sixty-three Indian portraits, landscapes, and totem-pole landscapes, in oil, pastel, and pencil, all from the Upper Skeena River country, British Columbia.

A large number of specimens have been loaned during the year. These loans have been principally to teachers and students at the Normal School, but the recent interest in aboriginal art, particularly that of the Northwest Coast, has induced a number of artists and craftsmen to make use of the specimens.

J. D. Leechman, the museum assistant in anthropology, entirely reorganized the work of caring for the anthropological specimens. A laboratory was equipped and put in running order and additional space for storage was provided. Unfortunately this space is already almost exhausted. During the year over 2,000 specimens have been cleaned, repaired, preserved, and treated in various ways. Some 1,500 specimens have been catalogued.

O. E. Prud'homme, the artist of the division, continued his work of drawing Nootka specimens and designs. He also drew pictographic and cranial material for the archæologist, a set of Eskimo specimens for work undertaken by D. Jenness, and did other related work required by the division.

Field and Office Research

Four scientific field trips were undertaken in the course of the year: a trip by Harlan I. Smith, archæological and ethnological, among the Bella Coola Indians of British Columbia; another by C. M. Barbeau on ethnological research among the Gitksan Indians of Skeena river, in British Columbia; a trip by Diamond Jenness, continued from the previous fiscal year, among the Carrier and Sikani Indians of British Columbia; and one by F. W. Waugh among the Montagnais Indians of the lower St. Lawrence.

E. Sapir continued work in the office on comparative Athabaskan linguistics, on a comparative study of Kwakiutl and Nootka, on Nootka grammar, texts, and lexical material, and on other phases of Indian linguistics. The following papers were published in the course of the year: "Personal Names Among the Sarcee Indians" (American Anthropologist, N.S., Jan.-March, 1924, pp. 108-119); "The Rival Whalers, a Nitinat Story (Nootka Text with Translation and Grammatical Analysis)" (International Journal of American Linguistics, vol. 3, 1924, pp. 76-102); "Racial Superiority" (The Menorah Journal, June-July, 1924, pp. 200-212); "Let Race Alone" (The Nation, Feb. 25, 1925, pp. 211-213). The following studies were prepared: "Anthropology and Sociology" (for a compendium on "The Social Sciences"); "Sound Patterns in Language" (to appear in Language); "The Hokan Affinity of Subtiaba in Nicaragua" (to appear in The American Anthropologist); and "Nootka Baby Words" and "A Chinookan Phonetic Law" (both to appear in International Journal of American Linguistics). A "Memorandum on the Problem of an International Auxiliary Language" was prepared at the request of the International Auxiliary Language Association.

Harlan I. Smith continued his studies and the writing of his report on the Bella Coola Indians area, giving special attention to ethnobotany, ethnozoology, ethnomineralogy, general material culture, and the remedies and medical practices of these people. A note on "A Bella Coola, Carrier, and Chilcotin Route Time Recorder" was published in the American Anthropologist, vol. 26, No. 2, April-June, 1924; a paper on "Sympathetic Magic and Witchcraft Among the Bella Coola," in the American Anthropologist, vol. 27, No. 1, January-March, 1925; and one on "Eagle Snaring Among the Bella Coola Indians" in The Canadian Field Naturalist, vol. XXXVIII, No. 9, November, 1924. Mr. Smith's paper on the "Entomology Among the Bella Coola and Carrier Indians" has been accepted for publication by the American Anthropologist.

C. M. Barbeau continued, from the middle of June to the end of November, the ethnographic research undertaken several years ago among the Tsimshian and Gitksan Indians of northern British Columbia. From June to the middle of October, investigations were carried on at Gitsalas, Gitsemgalem, Gitwinlkool, Kitwanga, and Gitsegyukla. The social organization and mythology of these tribes were studied extensively. A collection of sixty Gitksan songs was taken down in text and on the phonograph. Part of the linguistic notes taken were studied and sorted out, and now form a fairly extensive lexicon of separate elements. Over four hundred photographs were added to our collections. In the latter part of October and in November, investigations were extended to Kispayaks, Hazelton, and Hagwelget, in view of the preparation of a detailed report for the conservation of totem poles and graves, and the contemplated establishment of an Indian national park in Upper Skeena district. This report has since been prepared and presented to a Board composed of representatives of the Departments of the Interior, Mines, and Indian Affairs. The manuscript of "Indian Literature," which is to begin the series of books entitled "The Makers of Canadian Literature" (The Ryerson Press, Toronto), was completed in June and submitted to the editors.

D. Jenness was carrying on field work in British Columbia at the opening of the fiscal year 1924-1925. In April and May, 1924, he continued his researches among the Carrier Indians, visiting the reserves at Fort Fraser and Stony Creek, near the Canadian National railway. At the end of May he crossed from Prince George, on the Canadian National railways, to the headwaters of Peace river and spent three weeks with the Sikani Indians at Macleod, on McLeod lake. Thence he travelled down Parsnip river and up Findlay river to Fort Grahame, where he visited another band of Sikani Indians. He returned from Fort Grahame by way of Peace river, paying a short visit to the Beaver Indians at

Hudson Hope en route, and reaching Ottawa early in July. Altogether his field trip lasted nine months, from October, 1923, to July, 1924; during that period he investigated five separate bands of Indians concerning whom very little was known previously. Since his return to Ottawa Mr. Jenness has resumed his work on the series of Eskimo reports that embody the ethnological results of the Canadian Arctic Expedition, 1913-1916. Both parts of volume XIII (Eskimo Folk-Lore) of the Report of the Canadian Arctic Expedition were issued in the course of the year; they consist of "Myths and Traditions from Northern Alaska, the Mackenzie Delta, and Coronation Gulf" and "Eskimo String Figures," both by D. Jenness. Volume XIV, "Songs of the Copper Eskimos," by Helen H. Roberts and D. Jenness, was seen through the press; and considerable progress was made on the preparation of the linguistic and technological reports which are to be published as volume XV.

F. W. Waugh spent the summer season on ethnological research among the Montagnais Indians at Seven Islands, Quebec. A great deal of material was obtained on the technological aspects of their culture. On his way back to Ottawa from the field Mr. Waugh disappeared and no trace has been discovered of him since the latter part of September, 1924. The ethnological notes, photographs, and specimens obtained by him, however, had been forwarded to Ottawa shortly before and are now in the hands of the Museum.

T. F. McIlwraith's report on "The Bella Coola Indians" has been received. It is a detailed and systematic study of an important West Coast tribe and it is hoped that arrangements can be made for its early publication. Some data collected for the department by P. Radin among the Ojibwa of Ontario were published under the title of "Ojibwa Ethnological Chit-Chat" in the American Anthropologist, N.S., October-December, 1924, pp. 491-530.

Accessions

Accessions of Ethnological Specimens

Specimens collected in the course of field work by members of the Division of Anthropology include:

By Harlan I. Smith:

3 Chilcotin specimens from Bella Coola, B.C.
27 Carrier specimens from Ulkatcho, B.C.
2 Haida specimens from Bella Coola, B.C.
16 Bella Coola specimens from Bella Coola, B.C.

By C. M. Barbeau:

80 Tsimshian specimens from the Upper Skeena country, B.C.
1 Carrier specimen from Hazelton, B.C.

By F. W. Waugh:

8 Montagnais specimens from Seven Islands, Que.

By T. F. McIlwraith:

8 Bella Coola specimens from Bella Coola, B.C.

By Diamond Jenness:

38 Sikani specimens from McLeod lake, B.C.
48 Carrier specimens from Fort Fraser, B.C.

There have been received as gifts:

From the Royal Canadian Mounted Police:

758 Central Eskimo specimens from Ponds inlet.

From The North West Territories Branch, Department of the Interior:

Approximately 2,000 archæological specimens from Coats island and Baffin island.

From R. S. Finnie:

10 Central Eskimo specimens from Dundas harbour.

From Mrs. Otto Klotz:

15 specimens from various parts of Canada.

There have been acquired by purchase:

From Mrs. J. A. Teit:

3 Coast Salish specimens from the British Columbia coast.
82 Thompson River specimens from Spences Bridge, B.C.
7 Kootenay specimens from British Columbia.
4 Tahltan specimens from British Columbia.

From C. V. Smith:

17 Carrier specimens from British Columbia.
2 Sikani specimens from British Columbia.
1 Tahltan specimen from Telegraph creek, B.C.
92 Tsimshian specimens from Skeena river, B.C.

From E. S. MacDonald:

4 Central Eskimo specimens from Nueltin lake, Kee.

From C. Leden:

48 East Greenland Eskimo specimens.

Accessions in Physical Anthropology

Specimens collected in the course of field work by members of the Division of Anthropology include:

By Harlan I. Smith:

1 cranium from Bella Coola, B.C.

By W. J. Wintemberg:

Skeletal material from the Roebuck site, Ontario.

There have been received as gifts:

From the Royal Canadian Mounted Police:

Skeletal material, including 6 crania, from Ponds inlet, Frank.

From R. S. Finnie:

Skeletal material, including 6 crania, from Dundas harbour, Frank.

From J. D. Soper:

5 crania from Baffin island, Frank.
1 cranium and 1 lower mandible from Dundas harbour, Frank.

From T. L. Thacker:

Skeletal material, including 1 cranium, from Hope, B.C.

Exchanges

There have been transmitted to other institutions as exchange material:

24 Eskimo specimens to the Hudson's Bay Company's Historical Exhibit, Winnipeg, Man., in exchange for approximately 1,000 archæological Eskimo specimens from Coats and Mansell islands, Hudson bay.
9 Eskimo specimens to the North West Territories Branch, Department of the Interior, in part exchange for the transfer of archæological Eskimo material listed above.

Accessions of Phonographic Records

Records taken by officials connected with the Division of Anthropology:

By C. M. Barbeau:

54 Gitksan records from Gitwanga, B.C.

Photographic Work

Ethnological photographs taken or collected for the Museum by officers connected with the Division of Anthropology:

By C. M. Barbeau:

363 Tsimshian photographs (chiefly Gitksan) of Skeena River district, B.C.
87 Carrier photographs from B.C.
5 Tlingit photographs from Alaska.
6 Kwakiutl photographs from the northwest coast, B.C.
3 Haida photographs from Queen Charlotte islands, B.C.
14 Kaska photographs from northern British Columbia.
12 Tahltan photographs from northern British Columbia.
13 Babine photographs from northern British Columbia.
8 Sikani photographs from northern British Columbia.
6 Montagnais photographs from Quebec.
7 Huron photographs from Lorette, Que.
146 photographs of pioneer white men's activities in northern British Columbia (the Wm. Ware collection).
4 photographs from the Yukon (1898).
4 photographs from Quebec.

By F. W. Waugh:

63 Montagnais photographs from Seven Islands, Que.

By D. Jenness:

9 Beaver photographs from Hudson Hope, B.C.
10 Carrier photographs from Fort Fraser, B.C.
36 Sikani photographs from British Columbia.

By Harlan I. Smith:

153 Bella Coola photographs from Bella Coola, B.C.
52 Carrier photographs from Bella Coola, B.C.
15 Chilcotin photographs from Bella Coola, B.C.

By Photographic Division:

56 photographs of Gitksan portraits, totem poles, and landscapes, Upper Skeena country, B.C., painted by W. L. Kihn (by courtesy of Mr. Kihn).
1 photograph of Stoney painting, Banff, Alberta, painted by W. L. Kihn (by courtesy of Mr. Kihn).

There have been received as gifts:

From J. D. Leechman:

1 Thompson River photograph from Nicola valley, B.C.
9 Plateau Area photographs from Washington.
3 Washington photographs from Agate point.
51 Salish photographs from Washington.

From B. F. Jacobsen, Bella Coola, B.C.:

20 Bella Coola photographs from Bella Coola, B.C.

FOLK-LORE

C. Marius Barbeau, Ethnologist, reports:

There has been no subsidized research on folk-lore undertaken during the past year. But the collections were considerably increased through the continued efforts of collaborators, whose contributions are listed below. The fourth series of Folk-tales of French Canada, recorded by M. Adélard Lambert and edited by M. Gustave Lanctot, appeared during the summer in the *Journal of American Folk-Lore* (July issue, 1923). Folk Songs of French Canada, a volume prepared in collaboration by C. M. Barbeau and E. Sapir, was issued in March by the Yale University Press; and a small series of folk songs from the unpublished collections of the division were furnished to Sir Harold Boulton and Dr. Arthur Somervell, of London, England, by whom they are being prepared with settings and translations, to be published in England.

Accessions

French

The Arsenault (Abbé P. P.) Collection:

120 song texts recorded among the Acadians of Prince Edward Island.
111 song melodies recorded by ear.

The Lambert (Adélard) Collection:

45 song texts.
45 song melodies recorded on the phonograph.
1 English song text and melody.
4 folk tales.
2 narratives.
13 rhymes and formulæ.

The Massicotte (E.-Z) Collection:

77 photographs of old wooden crosses, shrines, people, and houses.
21 song texts.
2 song melodies recorded by ear.
2 folk tales with song.
2 spoken satires.
3 anecdotes.
2 rhymes.

The Barbeau (Marius) Collection:

116 photographs borrowed or reproduced from old albums.
1 folk song of France; text and melody.

The Mount-Duckett Collection:

16 song texts copied from an old MS song book (Jos. Gariépy).

The Roy (Régis) Collection:

1 folk tale.

The Marchand (Charles) Collection:

4 song texts.

The Hébert (Joseph) Collection:

1 song text.

Approximate totals (1914-1925):

5,412 song texts, excluding those from manuscript books, etc.
3,579 song melodies, recorded on the phonograph.
478 song melodies, recorded by ear.
316 folk tales.
184 anecdotes and narratives.
2,428 photographs.
105 melodies (dance).

A considerable collection of rhymes, sayings, folk medicines, and beliefs.
Also, abundant data on Canadian folk technology.

Specimens

A set of homespun samples from Charlevoix, Chicoutimi, and Temiscouata counties, donated by C. M. Barbeau.

ARCHÆOLOGY

Harlan I. Smith, Archæologist, reports:

The archæological exhibits remained practically unchanged during the year, and were open to the public.

Accessions

The accessions to the archæological collections are as follows:

Collected by Officers of the Division

Accession 298. Archæological material. From Fort Fraser, McLeod lake, and Stony creek, British Columbia. Collected by D. Jenness.
Accession 299. Fragments of pottery. From shore of Ottawa river near Oka, Quebec. Collected by F. W. Waugh.

Accession 300. Archæological specimens and five plaster of Paris moulds of petroglyphs. From the Bella Coola area, British Columbia. Collected by Harlan I. Smith.
Accession 301. Hammer made of stone. From near Bella Coola, British Columbia. Collected by T. F. McIlwraith.

Collected by Other Officers of the Department

Accession 302. Archæological specimens. From a shell mound, near Hakodate, Yezo, Japan. Collected by Hamilton M. Laing, Comox, British Columbia.
Accession 304. Three chipped pieces of rhyolite. From Abitibi dist., Quebec. Collected by W. F. James and J. B. Mawdsley.
Accession 305. One grooved maul. From Swift Current, Saskatchewan. Collected by L. H. Cole.

Gifts

Accession 295. Fragments of pottery. From Cornfields, Apache county, Arizona. Collected by Albert B. Regan, Cornfields, Arizona.
Accession 296. Archæological specimens. From Roebuck village site, Grenville county, Ontario. Collected by W. J. Wintemberg, Ottawa, Ontario.
Accession 297. One double-bitted adze blade of stone. From near Kimsquit, British Columbia. Collected by Joe Saunders, Bella Coola, British Columbia.

Purchases

Accession 303. Four archæological specimens. From Lytton, British Columbia. Collected by Mrs. James A. Teit, Spences Bridge, British Columbia.

Field Work

Archæological exploration was carried on in British Columbia by Harlan I. Smith, in continuation of his investigation of the material culture of the Bella Coola Indians, both past and present. Two additional petroglyphs were discovered at the site of the most extensive group of these remains known in Canada, that is, on the western side of the canyon a mile south of Bella Coola river some 3 miles above the mouth. Plaster of Paris moulds were made of two of the petroglyphs at the place and tracings were made of all those that had not been cast. A pictograph on the west side of Dean channel, near Kimsquit, was discovered and photographed. Sites of large, rectangular, semi-subterranean houses of a prehistoric village were located opposite the mouth of Dean river.

The petroglyphs on the north side of the mouth of Swallop creek, on the eastern side of Dean channel, about 17 miles from its head, were mapped and photographed. Plaster of Paris moulds were made of two of the best of them and tracings were made of all the others.

The prehistoric Bellabella fortification, village site, and petroglyphs on the east side of the mouth of Elcho harbour, Dean channel, were also mapped and photographed. The petroglyphs are on boulders on the beach at this place. A plaster of Paris mould was made of the larger petroglyph and a tracing of the smaller. Sir Alexander Mackenzie, the first white man to cross the continent north of Mexico, culminated his wonderful trip somewhere in sight of this place. Both the Swallop Creek site and the Elcho Harbour site are worthy of protection as national monuments. A large pictograph on the north side of Dean channel, 2 to 4 miles west of the Elcho Harbour site, was also photographed.

Photographs and motion pictures were taken of archæological sites, including the three Bella Coola villages shown on Mackenzie's map. Mr. Smith learned of the location of a cave said to contain pictographs and ancient ceremonial paraphernalia, in the valley of the Sowiltz, but had no opportunity to explore it during the season.

Office Work

An exhibit illustrating the prehistoric pottery of Canada and another showing aboriginal uses of copper in Canada were prepared by J. D. Leechman and exhibited at Toronto during the meeting of the British Association for the Advancement of Science, August, 1924. Mr. Leechman also prepared an exhibit showing the aboriginal uses of minerals, for the meeting of the Canadian Institute of Mining and Metallurgy held in the Victoria Memorial Museum, Ottawa, in March, 1925.

Mr. Smith continued his studies and the writing of his report on the archæology of the Bella Coola Indian area and the adjacent Bellabella area to the west. He prepared papers on the following subjects:

"A Prehistoric Petroglyph on Nocick river, British Columbia."
"A Prehistoric Earthwork in the Haida Indian Area."

Mr. Smith's paper on "The Petroglyph at Aldridge point, near Victoria, British Columbia," was published in the American Anthropologist, vol. 26, No. 4, October-December, 1924 (also separate); one on "Trephined Aboriginal Skulls from British Columbia and Washington," in the American Journal of Physical Anthropology, vol. VII, No. 4, October-December, 1924 (also separate). Another, "The End of Alexander Mackenzie's Trip to the Pacific," which refers to archæological sites and petroglyphs in the Bella Coola valley and on Dean channel, was published in the Annual Report of the Canadian Historical Association for 1924. One on "Unique Prehistoric Carvings Near Vancouver, B.C.," has been accepted for publication in the American Anthropologist.

Mr. W. J. Wintemberg continued his study of the culture of the prehistoric Iroquoian village site near Roebuck, Grenville county, Ontario, and the preparation of the monograph on this subject. He wrote an article on "Examples of Graphic Art on Archæological Artifacts from Ontario," which was published in the Transactions of the Royal Society of Canada, vol. XVIII, Third Series, 1924. He also prepared a paper on "A Tentative Characterization of Iroquoian Cultures in Ontario and Quebec, as Determined from Archæological Remains," which was read at the meeting of the British Association for the Advancement of Science, in Toronto, and which was published in abstract in the Report of the Association.

BIOLOGICAL DIVISION

EXHIBITS AND RESEARCH

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

Since April, 1924, very little progress has been made in the installation of exhibits in the Museum halls, although considerable work has been done in the preparatory sections. This lack of visible results is primarily due to delays in obtaining the construction material for the new unit plan cases which are now being built in the Museum shops. One case has been completed and installed in the east zoological hall, comprising a systematic collection of the Canadian species of diving birds and long-winged swimmers. Some of the birds are mounted singly and others in small habitat groups. These bird exhibits have been provided with a new set of labels, printed in large and easily-read type-faces, giving the main items of interest about the bird and its habits, supplemented by distribution maps indicating the summer and winter range of each species, and, wherever possible, by enlarged photographic prints of some scenes in the life history of the species. As full, complete, and attractive labelling adds greatly to the educational and public interest in the exhibits, it is hoped to carry the system of labelling to completion as soon as possible after the installation

of each exhibition case. As a long-awaited consignment of unit-sized mahogany sash and plate glass for case construction has recently been received at the Museum, it is hoped that several more cases may soon be ready for installation.

The large series of study and reserve specimens in the Museum is frequently consulted, supplementing the public exhibition series, and is always accessible to qualified students and research workers.

Special temporary exhibits were made in the Museum for the Twenty-seventh Annual Meeting of the Canadian Institute of Mining and Metallurgy, which was held in the Museum March 4, 5, and 6, 1925, the most important of which were: skins of typical Canadian fur-bearing mammals, small mammals of Nova Scotia, New Brunswick, and Alberta, showing the method of field preparations of mammal specimens; an exhibit by the preparatory department showing the methods of preparing specimens and accessories for exhibition in museums; a map of bird-banding returns; and a special exhibit of natural history paintings, drawings, and photographs. These exhibits and the co-operation shown by members of the staff of the Museum and the Geological Survey and by outside friends of the Museum, helped to awaken a more extended interest in the work of the Museum and its possibilities as a scientific and educational centre.

Many specimens are sent in every year from different parts of the country for determination, and numerous requests for information on a large variety of natural history topics and the literature on the subject are received from different departmental officials of the Dominion and the various provinces, as well as from the general public, and have been answered by the officers of the division. Numerous specimens have been loaned to schools for the illustration of natural history work, and selected natural history lantern slides have been loaned for lecture purposes to persons engaged in educational or wild life protection and conservation work. Series of bird slides have been kept for loan at the British Columbia office of the Department of Mines in Vancouver as well as in the Museum at Ottawa. Loans of special groups of animals and plants have also been made to museums and other institutions where specialists have been preparing technical monographs of certain groups.

OFFICE AND FIELD WORK

R. M. Anderson, zoologist (mammalia), Chief of the Biological Division, devoted some time to the administrative work and correspondence of the division and to the identification and study of the mammal collections. Card catalogue records of the bibliography of Canadian mammals are being built up, and numerous field notes collected and assorted bearing on the distribution, habits, and ecology of the different species of Canadian mammals. Some time was devoted to editing, arranging, and proof-reading the scientific reports of the Canadian Arctic Expedition, 1913-18, as general editor of reports for the Arctic Publications Committee. Mr. Anderson also represented the Department of Mines on the Advisory Board on Wild Life Protection, and as Canadian member of the Board of Directors of the American Society of Mammalogists attended the sixth annual meeting of the society at the Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts, where on April 17, 1924, he gave an illustrated lecture on "Mammal Life in the Heart of Gaspe." He was re-elected a director of the society for the two-year term 1924-26. By invitation of the sectional committee of Section E (geography) he attended the ninety-fourth annual meeting of the British Association for the Advancement of Science at Toronto, and on August 8, 1924, presented two illustrated papers, on "Scientific Work of the Southern Party of the Canadian Arctic Expedition, 1913-18," and on "The Present Status and Future Prospects of the Larger Mammals of Canada." The latter paper was published in The Scottish Geographical Magazine, Edinburgh, November, 1924.

Leaving Ottawa August 26, 1924, Mr. Anderson proceeded to Halifax, Nova Scotia, and arranged with Mr. J. A. Knight, Chief Game Commissioner of the province, for some co-operative work in the matter of investigation into the wild life conditions in the interior of Cape Breton island. Owing to communications with the east coast of Cape Breton being disarranged by the hurricane of August 26, it was decided to make this patrol later in the season in company with an official of the Nova Scotia game department. September 1, Mr. Anderson left Halifax and proceeded to Charlottetown, Prince Edward Island, and put in some time collecting specimens of small mammals and birds at Southport and Bonshaw. Leaving Charlottetown September 13 he proceeded to Wolfville, Nova Scotia, where he obtained valuable data from R. W. Tufts, Chief Migratory Bird Warden for the Maritime Provinces. After visiting Barrington passage, Shelburne county, to study the physiography of the region where C. H. Young was making a large collection for the Museum, he proceeded to Halifax September 22 and completed arrangements for the Cape Breton trip. Thanks are due to Mr. J. A. Knight, Chief Game Commissioner, for extending all possible aid and facilities for making the trip successful. Leaving Halifax September 24 Mr. Anderson proceeded by rail to Sydney, and from Sydney to Ingonish, Cape Breton island, on S.S. *Bras d'Or* September 26. Here he was joined by Mr. Harrison, deputy game warden, and on September 29, with two guides and packers, the ascent was made by the Clyburn Brook trail to the high, barren uplands of the interior. The interior of northern Cape Breton island is almost totally uninhabited, the only settlements being fishing villages, and small farms near the coast. The uplands are sparsely wooded and the central parts consist largely of more or less wet barrens, so that there are no regular trails, and travel must be by back-packing. Camp was made at Cheticamp lake and at various points near the head of Cheticamp river. The region about the head of Cheticamp river, Northeast Margaree, east branch of Indian river, Ingonish river, Mackenzie river, North Aspy river, and Black brook, along the boundary between Victoria and Inverness counties, was traversed, without seeing any recent signs of caribou. The reports in regard to the caribou of Cape Breton are very conflicting, and although there may be a small number remaining, they have evidently been greatly reduced in numbers within the past few years. The moose, which were common up to twenty-five years ago, are said to have become totally extinct on Cape Breton island, but the white-tailed deer, which have spread over the whole of the mainland of Nova Scotia, have crossed the strait of Canso within the past few years, and have now spread over a large part of Cape Breton. Tracks of white-tailed deer were found even on the barrens of the interior. A number of small mammals and birds were obtained in the interior, but in general all forms of animal life were scarce. The party returned to Ingonish October 9 and some time was spent in collecting on the coast. The steamer service being very irregular and infrequent due to stormy weather, Mr. Anderson returned to Sydney on a fishing schooner, and to Ottawa October 25.

P. A. Taverner, ornithologist, left for the north shore of the gulf of St. Lawrence June 28, arriving at Harrington, Saguenay county, Quebec, and embarked on the motor boat *Peroquet* through the courtesy of the Canadian National Parks Branch of the Department of the Interior and visited many interesting ornithological localities between Harrington and Natashkwan. Some very interesting bird rookeries were seen, especially a small rookery of common cormorant at Wapitagun and another of Caspian tern and ring-billed gull at Fog island. Few specimens were taken, but a number of photographs were made and several reels of motion pictures of the birds obtained by Mr. Ross of the Canadian Government Motion Picture Bureau, Department of Trade and Commerce, who accompanied the expedition. Thanks are due to Mr. Harrison F. Lewis, Chief Migratory Bird Warden for Ontario and Quebec,

and the Canadian National Parks Branch, for the opportunity of making the trip and for their many courtesies. Mr. Taverner left Natashkwan July 18 and arrived in Ottawa July 23.

The manuscript for the "Birds of Western Canada" was finished and prepared for the printer and is now in press. The coloured plates for this work were made from 100 water-colour paintings by Major Allan Brooks, D.S.O., of Okanagan Landing, B.C., and are up to his usual high standard of excellence. The manuscript for the "Aves" section of a Canadian Atlantic Fauna being prepared by the Biological Board of Canada, has been completed by Mr. Taverner, together with a large number of line drawings to illustrate the birds. This is a students' manual of the water birds of the Canadian Atlantic coast and will probably be published during the coming year.

Charles H. Young, senior collector-preparator, spent the season from May 9 to October 8 collecting birds and mammals in the vicinity of Barrington passage, Shelburne county, Nova Scotia, and made a very complete collection of beautifully prepared specimens. Mr. Young's collection is notable in containing several species very rare in Canada. An extremely severe hurricane on the night of August 26, from the south, seems to have brought in a number of unusual visitors. Among those taken by Mr. Young were four black skimmers, *Rhynchops nigra;* three laughing gulls, *Larus atricilla;* and a black tern, *Hydrochelidon nigra surinamensis.* Mr. Young also made some interesting records of small mammals, including a series of melanistic specimens of the red-backed vole *Evotomys.*

J. Dewey Soper, of Edmonton, Alberta, who had proved his energy and competence as a field naturalist for the Museum on the 1923 cruise of the C. G. S. *Arctic* to Greenland, Ellesmere island, North Devon island, and Baffin island, by making a remarkably extensive collection in several lines in spite of short periods on shore, was re-engaged in 1924 as junior zoologist and sent north with the 1924 expedition in the *Arctic,* sailing from Quebec July 5. He was landed at Pangnirtung fiord, Cumberland sound, Baffin island, about July 20, being outfitted to spend the winter of 1924-25 on Baffin island in the interests of the Victoria Memorial Museum. Mr. Soper set to work immediately and before the last boat left Pangnirtung September 8, he had made a large collection of birds and plants, and a few mammals, which reached Ottawa safely in October. In the early spring of 1925 he is expected to visit the interior of Baffin island by sledge and canoe, to make general collections, in the regions of the big lakes Netsalik and Amadjuak, and if possible make investigations of the breeding grounds of the Greater Snow and Blue Geese. He is expected to return to Ottawa on the return voyage of the C.G.S. *Franklin* in October, 1925.

Owing to the rare opportunity offered by the C.G.S. *Thiepval* being sent by the Department of the Naval Service to lay down bases of supplies for the British round-the-world flight, arrangements were made through the courtesy of the Director of the Naval Service, for Hamilton M. Laing, of Comox, B.C., to accompany the expedition as a naturalist for the Museum. The expedition sailed from Esquimalt, B.C., February 29, 1924, and visited many points along the coast of British Columbia, southeastern Alaska, Aleutian islands, Komandorski islands, Kamchatka, Kuril islands, and Hokkaido, Japan, returning in August. As a result the Museum received a large and valuable collection of pelagic and land birds from the North Pacific region, including a valuable series of ptarmigan from the outer Aleutian islands, as well as a collection of plants and photographs. A report of Mr. Laing's natural history observations on the cruise of the *Thiepval* is now in course of publication as a museum bulletin.

PREPARATORY DEPARTMENT

Clyde L. Patch, chief taxidermist and herpetologist; Claude E. Johnson, artist; D. Blakely, taxidermist; and J. E. Perron, museum helper-tanner, carried on a certain amount of local field work in the vicinity of Ottawa, collecting specimens and accessories for habital groups. Mr. Patch by request spent a week at Golden Lake, Ontario, as instructor in natural history subjects at a boys' camp. Thirteen lectures and radio talks on natural history subjects were given locally and in other centres by Mr. Patch. Four radio talks on birds were prepared and given by Mr. Johnson.

The following work has been done by the staff:

Bird and smaller mammal skins prepared for scientific study	216
Mammals, birds, and reptiles prepared for exhibition purposes	42
Larger mammal skins tanned (walrus, moose, caribou, deer, fox, wolf, grizzly bear)	24
Mammals, birds, and nests collected	49
Plaster reproductions (archæological specimens, reliefs) cast and coloured	38
Numerous cast and coloured leaves, grasses, fruit, and turtle eggs in wax; plaster exhibition bases	
Lantern slides and maps coloured	56
Colour plates and drawings	14
Photographs taken of amphibians and reptiles	25

Considerable art work was executed for divisions other than that of biology. This department maintains a collection of biological specimens for the use of artists, and for use in connexion with the teaching of natural science in educational institutions. During the past year 220 loans were made.

Joseph Rochon, osteological preparator, and Donald MacDonald, museum assistant, carried on six weeks' field work in Pontiac county, Quebec, and collected 74 specimens, among them being 2 bull moose, 1 cow moose, 1 calf moose. Work done in the laboratory included:

Specimens macerated: 1 moose, 2 moose skulls, 1 moose skull and legs, 2 deer, 1 caribou, 1 wolf, 1 muskrat (ligamentary), 1 skunk (ligamentary), 1 cat (ligamentary), 1 fox (ligamentary), 2 swans (ligamentary), and several deer skulls.

Specimens cleaned and prepared: 1 moose, 1 moose skull and legs, 2 moose skulls, 1 caribou, 1 fox, 1 skunk, 1 muskrat, several large skulls of different species, and hundreds of small skulls of different species.

Specimens repaired: 1 elk, 1 buffalo, 1 polar bear, 2 fur seals.

Specimens bleached and mounted: 1 caribou, 1 black squirrel, 1 pike skull (mounted only).

Accessions

Accessions to the biological collections:

Mammals received and catalogued	411
Birds received and catalogued	481
Reptiles and amphibians	181
Plants, sheets, net accessions	2,100

Accessions of mammals:

By members of staff:

C. H. Young, Nova Scotia	220
R. M. Anderson, Quebec	1
Prince Edward Island and Cape Breton	42
J. D. Soper, Baffin island, Frank	4
C. E. Johnson and D. Blakely, Ontario	4
J. Rochon and D. MacDonald, Quebec	70

By gift, outside of collections made by members of staff:

E. G. White, skull of male white-tailed deer

Capt. Jos. F. Bernard, 4 skins of rodents, with skulls, from northeast Siberia

Canadian National Parks Branch, Dept. of the Interior, 2 skins of beaver; 2 heads and parts of skeletons of mule deer, Alberta
G. M. Blanchet, Topographical Surveys, Dept. of the Interior, 1 skull of Barren Ground caribou, near topotype of *Rangifer arcticus*
North West Territories and Yukon Branch, Department of the Interior, 4 Atlantic walrus skins with skulls; 1 skin of bearded seal, 1 skin of harp seal, 1 skull of tundra wolf from Baffin island; collected by Major L. T. Burwash, exploratory engineer
Royal Canadian Mounted Police, 2 skins of partial albino moose, collected by Inspector T. V. Sandys Wunsch, northern B.C., through kindness of Col. Cortlandt Starnes, Commissioner R.C.M.P.
P. Foran, 1 woodchuck, Ottawa
F. Johansen, 1 bat, Ottawa
Edgar Lidington, 1 bat, Ottawa
A. Gibson, 1 star-nosed mole, Nova Scotia
Robert Harvie, Ottawa, 2 weasels, 1 red-backed mouse, 3 deer mice, from Rouyn township, Que.
Jos. Kluke, timber wolf, 1 skin with skull, 1 skull, Pontiac county, Que.

By purchase:

Dudley L. Dimock, Grand Cascapedia, Quebec, 2 skeletons of Canadian otter; 1 skin and skull of Canadian marten
C. W. Dawson, Hazelton, B.C., five skins with skulls of grizzly bear
H. F. Lambart, Ottawa, skin and skull of Canada grizzly from Mount Robson region, Alberta

Accessions of birds:

By members of staff:

P. A. Taverner, screech owl, Ottawa; 7 birds and 3 eggs, gulf of St. Lawrence; 4 birds from Fairy lake, Quebec.. 14
H. M. Laing, birds from cruise of *Thiepval*, northern B.C., south-eastern Alaska, Aleutian islands, Kamchatka, etc.. 209
C. H. Young, 29 birds and 1 set of eggs, Shelburne county, Nova Scotia. 30
R. M. Anderson, Prince Edward Island and Nova Scotia.. 10
J. D. Soper, Baffin island, Frank.. 85
D. Blakely, Rockland and Kinburn, Ont.. 2
C. E. Johnson and D. Blakely, Ottawa.. 29
J. D. Leechman, Ottawa.. 1
C. L. Patch, C. E. Johnson, and J. Skillen, Ottawa.. 7

By gift, outside of collections by members of staff:

L. S. Dear, 1 set of eggs of mourning warbler, near Fort William, Ont.
A. I. Gormley, 1 fulmar, in the flesh, Arnprior, Ont.
W. H. Preece, Sault Ste. Marie, Ont., 4 skins, blue jay, American merganser, marsh hawk, hawk owl.
Frank H. Farley, Camrose, Alberta, one skin of western tanager.
H. Mousley, Hatley, Quebec, 2 nests of parula warbler.
H. H. Pittman, Wauchope, Sask., 1 sprague's pipit.
Willie LaBrie, Kamouraska, Quebec, 2 skins of savanna sparrow, 1 mounted acadian sharp-tailed sparrow.
George Black, M.P., Dawson, Ykn., pair of mounted king eiders, 1 skin of black-bellied plover.
George White, Ottawa, green-winged teal, golden-eye, ring-necked duck, marsh hawk, and night heron, in the flesh.
Canadian National Parks Branch, Dept. of the Interior, 1 black skimmer, bill and foot, collected after great storm of Aug. 26, 1924, at Yarmouth, N.S.
1 king eider in the flesh, Shirley bay, Ottawa.
2 greater scaup ducks, from Hamilton, Ont., Harbour Commission.
6 trumpeter swans, 1 whistling swan, by J. A. Munro, British Columbia.
Wm. F. Hill. Richmond, Ont., 1 gannet in the flesh.
John H. Marshall, Ottawa, 1 lesser scaup and 2 wood ducks, in the flesh.
H. H. Pittman, Wauchope, Sask., 1 skin of dowitcher.
E. G. White, Ottawa, 1 redhead and 2 wings of greater scaup and ring-necked duck.
Fred G. Kennard, Newton Centre, Mass., 3 greater snow geese, in the flesh.

North West Territories and Yukon Branch, Department of the Interior, 48 bird skins, from Baffin island, collected by Major L. T. Burwash.
Chas. Macnamara, Arnprior, Ont., nest of yellow warbler with cowbird's egg embedded in bottom.
R. E. DeLury, Ottawa, 1 junco.
F. Johansen, 1 bird.
Museum of Zoology, University of Michigan, Ann Arbor, Michigan, harlan's hawk, skin, in exchange.
George White, Ottawa, 2 black ducks, in the flesh.
Ronald M. Stewart, 1 swan's sternum.
R. W. Podarsky, Charlton, Ont., 1 red-throated loon, in the flesh.
J. D. Leechman, Ottawa, 1 junco.
Canadian National Parks Branch, Department of the Interior, 1 scissor-tailed flycatcher, taken at York Factory, Hudson bay, Manitoba.

By purchase:
Mazaire Mercier, Saguenay county, Quebec, by H. F. Lewis, 1 arctic loon.

Accessions of reptiles and amphibians, and localities from which they were received:

American Museum of Natural History, New York	1
R. M. Anderson, Nova Scotia	11
J. Roland Brown, Hamilton and lake Simcoe, Ont.	36
Chas. Cherrier, Muskoka, Ont.	1
Norman Criddle, Treesbank, Manitoba	1
R. S. Finnie, Hull, Quebec	1
George Gartrell, Summerland, B.C.	1
George Glass, Norway Bay, Quebec	2
W. O. Graton, Ottawa, Ont.	1
Robert Hamilton, Ottawa, Ont.	6
Ralph Holt, Bella Coola, B.C.	1
F. Johansen, lake Simcoe and Ottawa, Ont.	24
J. D. Leechman, Hull, Quebec	1
John McKay, Ottawa, Ont.	1
R. O. Merriman, Hamilton, Ont.	15
W. S. Odell, Ottawa, Ont.	1
Clyde L. Patch, Norway Bay and Burbridge, Quebec, and Ottawa, Ont.	42
H. H. Pittman, Wauchope, Sask.	2
K. Racey, Boundary Bay, B.C.	1
Walter Ratcliff, Bella Coola, B.C.	1
J. Skillen, Otty lake, Ont.	1
Harlan I. Smith, Bella Coola, B.C.	11
C. M. Sternberg, Morrin, Alberta	3
D. A. Stewart, Ninette, Manitoba	1
T. L. Thacker, Hope, B.C.	3
Charles H. Young, Barrington Passage, N.S.	7
R. M. White, Beaurepaire, Quebec	2
M. Y. Williams, Foremost, Alberta	4

Important in the accessions of the year are a number of trumpeter swans *Cygnus buccinator*, with their sterna and one complete skeleton, transferred to the Museum by the Migratory Birds Protection Division of the Canadian National Parks Branch, Department of the Interior. These are birds that have died from various causes on the swan sanctuaries and which were rescued from decay through the energy and foresight of J. A. Munro of that Branch. These specimens give us a nearly complete history of the age development of the species in both plumage and sternal characters. The material received from the North West Territories and Yukon Branch, Department of the Interior, collected through the energy of Major L. T. Burwash, exploratory engineer, near cape Dorset, southern Baffin island, is of great interest as from a locality unrepresented in the collections of any museum. Among the specimens is a barnacle goose *Branta leucopsis*, a rare straggler from Europe.

NATIONAL HERBARIUM

M. O. Malte, Chief Botanist of the National Herbarium, was during the spring and major part of the summer engaged in botanical research preparatory to a general revision of the National Herbarium, necessitated through the adoption of International Rules of Botanical Nomenclature, and progress in the science of botany in general. Some time was also spent in connexion with the issuing of two reports of the Canadian Arctic Expedition, 1913-18, viz.:

Vol. IV (Botany), Part D: Lichens, by G. K. Merrill, issued July 16, 1924.
Vol. V (Botany), Part C: General Observations on the Vegetation, by F. Johansen, issued October 7, 1924.

From August 7 to 14 the Chief Botanist attended the meetings of the British Association for the Advancement of Science, held in Toronto, Ontario. Arrangements were then made for extensive exchange of herbarium specimens with the Royal Botanical Gardens, Kew; the British Museum, London; and the Botanical Museum, Copenhagen. At the same time the Herbarium of the University of Toronto was examined for records pertaining to the flora of the Ottawa district.

The rest of the summer was spent in the Maritime Provinces, one of the principal objects being to study the grass flora. Aside from purely scientific results, it was found, particularly in Nova Scotia and Prince Edward Island, that many forms of wild Bent Grasses occur which are eminently suitable for lawns, greens, and turf in general, and which, if propagated judiciously, will undoubtedly prove superior to corresponding forms now grown from seed imported at high prices from Europe and other parts of the world. One of the forms, commonly known to the trade as Rhode Island Bent Grass, has already, as a result of action taken by the Dominion Department of Agriculture, been successfully put on the Canadian market.

After his return from the Maritime Provinces the Chief Botanist spent most of the time working up collections made during this and previous years.

A large collection of fungi, mostly parasitic, was, with the approval of the late Director of the Victoria Memorial Museum, Dr. William McInnes, transferred to the Botanical Division, Central Experimental Farm, Ottawa.

On December 27, 1924, the Chief Botanist proceeded to Washington, D.C., to attend the meetings of the American Association for the Advancement of Science. During the time spent in Washington, amounting to two weeks, he had a much appreciated opportunity to study in detail several intricate problems pertaining to the flora of Canada. He wishes to express his gratitude, particularly to the Director and staff of the Smithsonian Institution, the Senior Agronomist in Charge, Bureau of Plant Industry, and the Librarian, United States Department of Agriculture.

A multiplex exhibition stand for pictures, with twelve double-faced frames, was installed in the east biological hall, to hold photographs of about 150 species of local fungi, collected by W. S. Odell of Ottawa, and photographed in life by the Photographic Division of the Geological Survey.

Plants received outside of collections made by staff:

H. F. Lambart, Ottawa, from Rocky mountains	197
Gray Herbarium, Cambridge, Mass.	1,982
Dr. H. Hapeman, Minden, Nebraska	201
Sergeant A. H. Joy, Royal Canadian Mounted Police, from Baffin island, Frank	29
A. J. Pineo, Alberni, B.C.	15
Hamilton M. Laing, Comox, B.C., from cruise of *Thiepval*, northern B.C., southern Alaska, Aleutian islands, Kamchatka, and Japan	246
Frits Johansen, Ottawa	28
Hungarian National Museum, Budapest	500
Dr. Harold St. John, Pullman, Wash.	297
Major L. T. Burwash, Ottawa, from Baffin island, Frank	62
Total	3,557

Plants distributed:

Botanical Museum, Copenhagen, Denmark	306
British Museum, London, England	206
Danish Arctic Station, Disko, Greenland	63
Gray Herbarium, Cambridge, Mass	119
New York Botanical Garden, Bronx park, New York	79
Toronto University, Toronto, Ontario	46
Botanical Museum, University of Helsingfors, Finland	75
United States National Museum, Washington, D.C	93
Prof. J. H. White, University of Toronto, Toronto, Ontario	90
W. R. McColl, Owen Sound, Ontario	26
Dr. C. R. Ball, Washington, D.C	11
Total	1,114

At the end of the fiscal year the number of mounted and numbered sheets was about 114,000 as against 111,900 at the end of the last fiscal year.

MINES BRANCH

John McLeish, Director

Good progress has been made during the past year in the various investigations under way in the Mines Branch organization. As usual, a large amount of testing and analytical work has been done. Where the results are of general public interest—and most of them are, in respect to the larger investigations—they are being put into form for inclusion in one or other of our several annual reports on investigations.

Numerous reports have been prepared for correspondents and personal inquirers with respect to Canadian mineral resources. In addition to the regularly published results of the Branch's investigations, a large amount of information has been written up for special distribution through the technical and financial press, both in Canada and abroad.

Changes in staff during the year included the loss by death of two prominent officers and the resignations of ten individuals, including temporary and permanent employees. Six vacancies were filled by promotion, and nineteen appointments made, of which six were in the engineering and chemical classes. Mr. Harold Kohl, who had been engaged in special work on the investigations of fuels, died on April 28, 1924, following a week's illness. Mr. George Middleton, manager of the Dominion of Canada Assay Office at Vancouver since 1907, died on March 8, 1925, at San Diego, California, while on leave. Mr. Kohl, although only a few years in the Branch, was rendering excellent service, and Mr. Middleton had long since established a reputation for painstaking and careful public service in the administration of the Vancouver Assay Office.

The function and organization of the Mines Branch have been described in some detail in reports of previous years. The extent to which the present organization is able to cover the very broad field open to it is indicated in the following review, and it will be apparent that there are many directions in which the work might be extended to national advantage. Last year the Nova Scotia Government, confronted with a problem connected with the operation of coal mines, called in consultation an official of the United States Bureau of Mines. Several years ago, the British Columbia Government took similar action. Incidents such as these illustrate the possibilities of greater service by the Federal Mines Department to the Canadian mining industry in respect to the actual operation of mines and the protection of life and property.

CO-OPERATION WITH OTHER ORGANIZATIONS

The Mines Branch endeavours to co-operate to the fullest extent with provincial and other Government departments and with scientific organizations engaged in similar lines of investigations, and to be of service to those Government departments desiring assistance of the character the Mines Branch is able to give. In this connexion special reference may be made to the Department's contributions of literature illustrative of Canadian mineral resources and the mining industry, for distribution at the British Empire Exhibition at Wembley, and to the personal representation at the Exhibition; to numerous chemical examinations for other departments; to co-operation with provincial highway departments of Nova Scotia, New Brunswick, and Quebec, in respect to investigations of road-building material; to the carrying on of investigations for, and in co-operation with, the Dominion Fuel Board; to assisting in the Government purchase of coal under specifications; to acting as consulting advisers in respect to the disposal of the Lignite Utilization Board's property

and equipment; to co-operation with the special committee appointed to arrange for the representation of Canada at the World's Power Conference at London in July, including the preparation of a comprehensive paper on Canadian fuels therefor, and representation at the conference.

REVIEW OF ACTIVITIES

As in previous years the Director devoted much time to the work of the Dominion Fuel Board, of which he is vice-chairman. He also acted as a member of the Advisory Committee to the Department of the Interior on Mining Regulations, and as a member of the Helium Committee of the Honorary Advisory Council of Scientific and Industrial Research. Inspections were made of several metallurgical and industrial plants. The annual conventions of a number of scientific and engineering societies were attended, including the annual meeting of the British Association for the Advancement of Science, held in Toronto in August, and the annual summer meeting of the American Institute of Mining and Metallurgical Engineers held at Birmingham, Alabama, in October. Several contributions were made to the technical press in respect to the general work of the Mines Branch and on certain phases of the Canadian mining industry.

MINERAL RESOURCES DIVISION

A. W. G. Wilson, Chief of the Division, reports:

The opening of the Canadian Pavilion at the British Empire Exhibition in Wembley park, London, stimulated interest in Canadian resources to such an extent that an unusual number of inquiries relating to Canadian mineral and chemical industries were being received both at Wembley and at the office of the Canadian High Commissioner in London. It was, therefore, decided to station a technical officer in London for the period of the exhibition and this duty was assigned to A. W. G. Wilson, Chief of the Division, who left Ottawa on May 23 and returned on October 19. Mr. Wilson's services were available both to the office of the High Commissioner and to that of the Canadian Exhibition Commissioner. The more important inquiries received were principally from persons in search of new sources of raw materials of mineral origin, from investors interested in Canadian mining development, and from manufacturers interested in possible Canadian markets. Mr. Wilson visited a number of industrial plants and mining centres in Great Britain where mineral products are utilized or where operations of interest to Canadians are in progress. He also found an opportunity of introducing Canadian dead-burned magnesite to British consumers. If Canadian producers of this material are able to compete successfully with foreign products now sold on the British market an important trade in this commodity should result.

FIELD WORK

L. H. Cole devoted the greater part of his time to the preparation of his report on sodium sulphate in western Canada. The field duties performed by M. F. Goudge on the alkali deposits of Canada were also under his supervision. About one month was spent on miscellaneous minor field duties and several lectures on the alkali lake deposits were given before technical societies.

M. F. Goudge was engaged on field work in Saskatchewan from February 11 to April 5. About one month was spent sampling the salt deposit at Muskiki lake, and the balance of the time was devoted to studies of the winter conditions which prevail at the more important alkali lakes in western Canada. Regular field work began on May 19 and continued to November 5. During this

interval seven deposits were drilled and sampled, and about thirty others were visited, examined, and sampled where necessary. The last month of the field season was devoted to the examination and sampling of eighteen deposits of alkali salts in British Columbia. Nine of these contained sodium carbonate as the principal constituent; seven, magnesium sulphate; and two, sodium sulphate.

S. C. Ells continued his examination of the deposit of bituminous sand in northern Alberta, about five months being spent in the field. The field work included shaft sinking into unaltered bituminous sand at points somewhat removed from actual exposures; the mining and shipping in sealed containers of a quantity of bituminous sand for use in connexion with laboratory research; levelling operations; and the examination of certain outlying occurrences of bituminous sand. During most of the year Mr. Ells was assisted by Mr. C. H. Freeman of the office staff.

A. H. A. Robinson was engaged on field duty during July and August and parts of September and October. The first two months of the field season were devoted to topographical mapping of an area in Bourget township, Lake St. John district, Quebec, followed by a magnetometric survey of titaniferous iron deposits on lots 44 and 45, range I, of this township. This group of deposits was found to be one of the largest, if not the largest, of its kind in Canada. The ore carries between 40 and 50 per cent iron and about 15 per cent titanium. The deposits are located close to a railway line, which connects with St. Lawrence ports, and are in proximity to one of the largest, and perhaps one of the cheapest, sources of hydroelectric power in America. These conditions warrant the hope that in the near future they may be utilized for the manufacture of titanium white and electrolytic iron, or for the production of the recently invented Titan cements. Mr. Robinson considers that conditions in Lake St. John district seem to be eminently favourable for the manufacture of these cements in the electric furnace, electric pig iron being also obtained as a by-product. The latter part of the season was spent on a reconnaissance trip through the new gold fields in western Quebec.

V. L. Eardley-Wilmot was engaged in a study of natural abrasive materials and their uses. He spent four and one half months on field duty, chiefly in Ontario and Quebec, and towards the end of the season visited a number of garnet mines and mills in the United States, as well as the works of certain firms making artificial abrasives, grinding wheels, and other products. During the field season all the reported occurrences of natural abrasives in Ontario and Quebec were examined and visits were paid to all the firms producing either artificial abrasives or wheels. Industries using abrasive materials were also visited to learn trade specifications and to study operating conditions.

R. T. Elworthy, of the staff of the Chemical Division, was assigned to field duty under the Chief of the Mineral Resources Division, in connexion with a search for helium and a general investigation into the character and composition of Canadian natural gases. The production and technology of carbon black were also studied. Field work included sampling of gas wells in southern Ontario and in Alberta. In the latter province the gas fields in Peace River district, on Athabaska river near Pelican rapids, in the Wainwright field, and in the Turner Valley field, were visited. The laboratory examination of samples collected the previous year occupied the first five months of the year.

OFFICE WORK

During the absence of the Chief of the Division in Great Britain the report on the "Development of Chemical, Metallurgical, and Allied Industries in Canada," completed the previous year, was passing through the press.

Mr. Arthur Buisson, assisted by a staff of five, is in charge of the mineral resources record files.

Mr. John Casey, with one assistant, is responsible for maintaining complete statistical records of the mineral industry in order that such information may be readily available to technical officers of the staff.

Numerous inquiries on various subjects relating to the mineral industry, chemical manufacturing, metallurgy or chemistry of the rare elements, company organization, and other matters are received throughout the year and are referred to this division for reply. The officers of the division during the past year wrote about 3,700 letters, including about 2,000 replies to inquiries. In addition, about 1,500 circular letters were sent out in connexion with the compilation of lists of active operating mining properties. Replies to inquiries range from short letters of a few lines, easily dealt with in ordinary routine, to technical memoranda whose preparation occupies the time of a technical officer for several days, and whose cost of preparation must amount to a very considerable sum. The number of inquiries received has been steadily increasing during the last few years and the preparation of the replies makes serious inroads on the time of technical officers whose services are required for investigative work. Repeated interruptions of this kind interfere with the continuity of any work that is in progress and result in a serious loss of efficiency. Much of this work had to be referred to the records section of the division for action, and as a result the progress made in compiling records of mining resources has not progressed as rapidly as is desirable. The appointment of a senior technical officer whose principal duty will consist in compiling technical information for correspondents and others is now a very necessary development in the organization of this branch.

ORE DRESSING AND METALLURGICAL DIVISION

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

W. B. Timm, Chief of the Division, directed the work of the laboratories, and devoted considerable time to the establishment of a non-metallic laboratory. In connexion with the investigations in progress, he visited the gold fields of northwestern Quebec, the milling plants at Porcupine and Kirkland Lake, the concentration plants at Cobalt and South Lorrain, the smelting works at Sudbury, the lead-zinc concentrator at Notre-Dame-des-Anges, and the metallurgical and chemical works at Shawinigan Falls. He prepared the following articles for the Mines Branch memorandum series:

"Experimental Tests, Mines Branch Laboratories, on the Beneficiation of Canadian Iron Ores."

"The Selective Flotation of the Lower Grade Nickeliferous Pyrrhotite Ores of Ontario."

He prepared articles descriptive of the large ore concentration plants in Canada, including the Sullivan concentrator, Kimberley, B.C., the Silversmith concentrator, Sandon, B.C., the Britannia concentrator, Britannia Beach, B.C., the Granby concentrator, Anyox, B.C., the Copper Mountain concentrator, Allenby, B.C., the Rossland concentrator, Trail, B.C.

Mr. Timm reports that a large amount of experimental work was conducted on Canadian ores, that reports were made thereon, and that satisfactory progress has been made on those investigations not brought to completion. Under his direct supervision the following investigations were made:

Preparation of an asphaltic water-proofing compound to be used in the manufacture of paper board.

Examination of, and experimental tests on, a gold ore from the Dominion claims, Copper lake, Man.

C. S. Parsons visited, and prepared a description of, the new concentrator at Eustis, Que., at the request of the Eustis Mining Company; visited the concentrator at Notre-Dame-des-Anges, Que., and also Montreal and Shawinigan Falls, Que., in connexion with the extended use and manufacture of flotation reagents in Canada. He prepared the following articles for the Mines Branch memorandum series:

"Selective Flotation as Applied to Canadian Ores."
"Concentration of the Lead-zinc Ores of Eastern Canada."

He conducted the following investigations:

Concentration of the zinc-lead ores and zinc-iron middlings of Notre-Dame-des-Anges, Que.
Metallurgical treatment of a gold ore from Mine Centre, Ont.
Concentration of a gold-copper ore from Sproat lake, near Alberni, B.C.
Amalgamation versus blanket concentration of the gold ore of the Rex mine, northern Manitoba.
Concentration of molybdenite ore from the Moss mine, Quyon, Que.
Examination of mill tailings from Wright-Hargreaves mine, Kirkland Lake, Ont.
Concentration of a silver-lead ore from Portland Canal district, near Stewart, B.C.
Concentration of titanite (sphene) from pegmatite vein material.
Concentration of the lead-zinc ore of the Reader mine, Calumet island, Que.

R. K. Carnochan, devoted a large part of his time to the preparation of plans and obtaining information and data in connexion with the equipment of a non-metallic laboratory for the division. In addition to many tests of a minor nature, he conducted the following investigations:

Concentration of a lead-zinc ore from Riondel, B.C.
Concentration of garnetiferous gneiss from Barry Bay, Ont.
Dressing of mica in preparation for splitting.

J. S. Godard assisted Mr. Parsons with his investigations and conducted the following:

Metallurgical treatment of the Windpass ores, Chu Chua, B.C.
Examination of mineralized dyke material from Larder Lake, Ont.
Examination of mill tailings, Cadwallader creek, B.C.

H. C. Mabee supervised the work of the chemical laboratories and reports that over 5,000 chemical determinations were made on 1,511 samples, an increase of 15 per cent over 1923. He has in progress a special investigation, namely:

Recovery of the iron and sulphur content in addition to the nickel, copper, and precious metal values from nickeliferous pyrrhotite ores, and ores of a similar nature.

B. P. Coyne was engaged on the chemical analytical work and assisted the engineers on the chemical problems encountered in conducting their investigations.

R. A. Rogers, appointed in July, 1924, to the vacancy created by the resignation of D. T. Fotheringham in February, was engaged on the chemical analytical work of the division.

R. J. Traill continued the investigation, namely:

Hydro-metallurgical treatment of iron sulphide ores for the production of electrolytic iron and the recovery of sulphur and other metals as by-products.

He devoted considerable time to the equipment of a hydro-metallurgical laboratory for making test runs on a small scale, with complete cycle of operations. He attended the meetings of the Electro-Chemical Society in Philadelphia and Detroit.

W. R. McClelland was appointed in February, 1924, in a temporary capacity, to assist Mr. Traill with the above investigation.

FUELS AND FUEL TESTING DIVISION

B. F. Haanel, Chief of the Division, reports:

Mr. Haanel reports increased activity. Three changes occurred on the chemical staff during the year, viz., the death of Harold Kohl, the appointment of H. McLeod as temporary junior chemist, and the transfer from the Ore Dressing Division of G. E. LeWorthy as temporary senior laboratory assistant. The staff of technical engineers was increased by the temporary employment of Messrs. G. W. Read and R. A. Bolton.

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

Mr. Haanel, in addition to his regular duties, devoted a large part of his time to preparing for publication the final report of the Peat Committee, and to work in connexion with the Dominion Fuel Board. He was also appointed an official delegate of Canada to the World Power Conference in London, England. In this connexion he was absent from Ottawa from June 2 to September 7. At the conclusion of the Conference, he investigated several plants where work in low temperature carbonization of bituminous fuels was being carried on, and a process for dehydrating peat and manufacturing the dehydrated product into a fuel. In company with Professor Purcell, special peat investigating officer for the British Fuel Research Board, he examined the work which was being done by Sir John Griffith on the manufacture of peat fuel in Ireland. Mr. Haanel also examined low temperature processes in Germany; the Hydro-Peat process for manufacturing a peat fuel as employed in Denmark; and a steam power plant erected in Italy at Torre del Lago, where the fuel used for generating steam was obtained from a submerged peat bog. This plant, which is a combination Mond gas producer steam power plant, will generate electric energy for operating a portion of the Italian State railways. While in Sweden he examined several industrial plants where the Ruth's Steam Accumulators are installed. Remarkable steam economies are obtained in plants through the introduction of the Ruth's Steam Accumulator where steam is used in the process of manufacture. Mr. Haanel attended the annual meeting of the Engineering Institute of Canada, and in company with Arthur A. Cole, Mining Adviser to the Temiskaming and Northern Ontario railway, examined and made a report upon the alterations made by Peat Fuels Limited to the peat manufacturing plant at Alfred, Ontario. In addition to the above, he made several special reports on low temperature carbonization processes.

E. S. Malloch continued the testing begun in 1922 of substitute domestic fuels in the experimental hot water heating plant installed at the Fuel Testing Station. Up to the end of March 31, 1925, sixteen different fuels were tested. E. C. Baltzer, permanent engineer of this division, assisted Mr. Malloch in this work. From October 11 to November 7, Mr. Malloch was occupied on field work, investigating the methods of utilizing western fuels in domestic heaters at Winnipeg, Moose Jaw, Vancouver, Victoria, and Edmonton. While in the west he attended the meetings of the Canadian Institute of Mining and Metallurgy at Blairmore, Alberta.

FUEL TESTING LABORATORY WORK

R. E. Gilmore, Superintendent, reports that during the year 1924 a total of 780 samples of solid, liquid, and gaseous fuels were examined. Roughly, 36 per cent of these samples were sent in from other Mines Branch divisions, from the Geological Survey, from other Government departments, and from commercial firms and individuals. The remaining samples pertained to investigations conducted by the chemical and engineering staffs of the division.

Coals and Other Solid Fuels. Four hundred and one samples of different kinds of coal; thirty-nine of coke; eighty-six of peat, and fourteen briquettes and miscellaneous samples were analysed according to standard laboratory methods.

Oil-shales and Tar Sands. Forty-eight samples of oil-shale products and eight of bituminous tar sands were examined.

Petroleum Products. Twenty-two samples of crude oil; eighty-four of gasoline; thirty-four lubricating oils, and eight of other petroleum products were analysed in the oil laboratory.

Gas Samples. A total of thirty-six samples of coal and oil-shale gas were examined in a standard gas analyses apparatus.

Investigations Conducted by the Chemical Staff

Under the supervision of Mr. Gilmore, the special work of testing the coals from the Maritime Provinces for the production of a domestic coke was brought to completion and a report prepared. Other investigations conducted are given under the names of the chemical engineering staff as follows:

J. H. H. Nicolls, in addition to looking after the records of solid fuels analyses, completed a study of the friability of various fuels sold in Canada for household and steam purposes. These friability tests, which are comparative only, indicate the general handling and storage qualities of the fuels tested. Mr. Nicolls also carried out drying experiments on lignite coals, comparing the results obtained in the new constant humidity air-drying apparatus with the old method of air-drying in the open air.

P. V. Rosewarne, assisted by Mr. Chantler, conducted the regular annual survey of gasoline sold in Canada. This survey consisted of the collection and examination of fifty-nine samples from thirteen widely separated Canadian cities. Mr. Rosewarne also completed the examination of various lubricating oils and prepared a report on the same.

R. A. Strong paid especial attention to carbonization problems and carried out a series of washing and carbonization experiments on the slack sub-bituminous coal from Coal valley, Alberta. Mr. Strong also made two trips to inspect new coal carbonization processes, one to Ford, Ontario, in connexion with the Caricristi or Piron process, and the other to Toronto regarding the Heyes process.

A. A. Swinnerton devoted most of his time to the comparison of different laboratory methods for retorting oil-shales, as a preliminary to the selection and adoption of a standard laboratory method for the examination of oil-shale samples. Mr. Swinnerton also did considerable work on the comparison of oil sands from Pechelbron, Alsace, with the Alberta bituminous sands.

Work of the Mechanical Superintendent

The Mechanical Superintendent, A. W. Mantle, reports increased activity in the construction of new machinery and apparatus, and to the repairs to plant already in existence.

CERAMICS AND ROAD MATERIALS DIVISION

Howells Fréchette, Chief of the Division, reports:

The activities of the ceramic work were increased, but a decrease in the road materials investigations occurred, owing to the resignation of Mr. Henri Gauthier, road materials engineer, which took effect August 31, 1924. Miss E. M. Campbell, senior laboratory assistant, resigned October 28, and Miss I. McLeish was transferred from the office of the Director to fill the vacancy December 1.

CERAMICS

There has been an increasing tendency on the part of brick manufacturers to avail themselves of the services of this division.

During the months of July, August, and September, Mr. Fréchette visited many of the clay-working plants in Ontario, Quebec, and the Maritime Provinces, studying their activities and problems.

Louis P. Collin, ceramic engineer, conducted an investigation of the cost of burning brick under various conditions. Detailed work was done at sixteen plants in Ontario and Quebec. Incidental to this a number of problems associated with brick burning were studied. The manufacturers welcomed the work and co-operated by furnishing such data as they had available. Suggestions were made at several plants which, if carried out, should result in considerable saving in the cost of manufacture, or in raising the quality of the products. It was found that in a great many cases cost accounting had been neglected, either completely, or else not carried to sufficient detail. Close check on the cost of the various operations contributing to the total cost of manufacture will indicate the cause for otherwise inexplainable fluctuations in cost of production and will frequently point to possible savings that might be effected.

During the year, ninety-two samples of clay and shale were received and tested to determine their physical properties and their suitability for use in the manufacture of ceramic products. Eighteen samples of brick and tile from five manufacturers were tested for the determination of porosity, transverse strength, and compression strength. Tests were made for four manufacturers to determine the proper procedure to prevent the scumming of their brick during manufacture. Various other tests were made for officers of the department and others.

The facilities of the ceramic laboratories, and assistance of the staff were placed at the disposal of the Air Board and the Department of Marine and Fisheries for special tests, and one of the magnesite producing companies for experiments in the making of magnesite brick.

Mr. Collin devoted considerable time to the preliminary work of an investigation on the compounding of ceramic bodies for use in electrical heating devices.

ROAD MATERIALS

During the field season of 1924 investigational work on road materials was carried on in New Brunswick, Nova Scotia, and Quebec by R. H. Picher.

The greater part of the time was spent in New Brunswick where most of the stone deposits lying close to, or along, the main highways were visited. The deposits where the material looked suitable for road-building purposes were carefully examined and sampled for testing. A study of the condition of the road surface was also made in order to ascertain the ability of the material at present used in the surfacing to resist wear under different traffic conditions. The work covered all the main highways of the province, except the Woodstock-Edmundston highway, which on account of lack of time was not examined in detail.

In Nova Scotia, a survey was made along several sections of the Amherst-Oxford-Truro highway, where good, durable road-surfacing material is absent. A 2-mile strip on each side of the several sections was covered, in order to locate any surfacing material which, if not durable, would at least greatly improve the existing condition of the roads.

In Quebec, at the request of the Provincial Highway Department, samples of Trenton limestone were collected for testing. This stone is very common and much used in several parts of the province, and it was deemed advisable

to test samples from the different points whence it is obtained, to determine its road-making qualities, and compare it with the Montreal and Ottawa limestones, which have already been tested.

The laboratory work consisted of testing the samples collected during the field season. Full tests were also made on six samples of stone submitted by producers of crushed stone.

CHEMISTRY DIVISION

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

During the period April 1, 1924, to March 31, 1925, 1,870 specimens have been examined and reported upon. This number is considerably greater than during any preceding year.

H. A. Leverin, in addition to his work as analyst, prepared a preliminary report on "The Manufacture of Titanium Pigment from Ilmenite."

R. T. Elworthy made an investigation of the helium resources of Ontario and continued the field examination of natural gas in western Canada.

The investigation on the production of formaldehyde by the partial oxidation of natural gas was given further attention.

A number of mineral waters from British Columbia were analysed and the results incorporated in a report on "Hot Springs in British Columbia" which was prepared for publication.

R. J. Offord, senior laboratory assistant, accompanied Mr. Elworthy in Alberta, and carried out many of the analyses of natural gas and of mineral waters in the laboratory.

E. A. Thompson made analyses of eighty-eight diatomaceous earths; of supposed bauxite ore from Vancouver island; and of talc; as well as chemical and microscopic examination of several zinc-lead ores, and of gold ores, for the Ore Dressing Division.

A study of the methods of detection of small quantities of tellurium in ores, and of the valuation of bauxite, was commenced, but through pressure of more urgent routine work was not carried to completion.

A. Sadler, in addition to his work as analyst, has had charge of all the furnace assays for precious metals, and the determination of carbon in fifty-eight steel spring wires for the Department of Customs and Excise.

J. Moran has given the major part of his time to the analysis of mine air samples submitted by the operating collieries, chiefly in the west. He has also prepared several memoranda for the guidance and assistance of collectors of these samples, and has carried on such other determinations and examinations as were allotted to him.

G. P. Connell has made numerous analyses of western alkali salts, and of diatomaceous earths, and other minerals.

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

George Middleton, manager of the Assay Office Division, 1907, died on April 8, 1925, at San Diego, California, while on leave. Mr. G. N. Ford who was placed in charge during Mr. Middleton's absence, has continued to the end of the year as acting manager. Prior to his departure on leave Mr. Middleton reported the receipt of deposits during the calendar year ended December 31, 1924, as follows:

The value of gold bullion deposited during the year amounted to $1,850,373.74, being a decrease of $200,995.91 as compared with the preceding year. The number of deposits, however, was fairly well maintained, being 1,618, as against 1,639 during the calendar year 1923.

Although the business transacted during the year just ended was somewhat disappointing, there is good prospect of an increased gold production in British Columbia during the coming season and particularly is this so with reference to Cariboo district, where a large gold dredge has recently been constructed and is ready for operation.

The purchase and disposal of the gold bullion deposited at this office during the year required a total of 1,692 meltings and 1,692 assays (quadruplicate check assays being made in each instance), including the melting into large bars of the smaller deposits after purchase and the assaying of same prior to shipment.

The aggregate weight of deposits before melting was 114,041.96 troy ounces and after melting 107,569.15 troy ounces, showing a loss in melting of 5.6758 per cent. The loss in weight by assaying (base and parted silver) was 26.63 troy ounces, making the weight of bullion after melting and assaying 107,542.52 troy ounces, the average fineness of same being 0.830¾ gold and 0.122 silver.

The deposits were derived from the following sources:

—	Number of deposits	Before melting and assaying	After melting and assaying	Net value
		Troy ozs.	Troy ozs.	$ cts.
Bars, Nuggets, and Dust, Amalgam, etc.—				
British Columbia	572	63,460·21	58,652·24	1,084,983 84
Yukon Territory	474	44,365·96	43,265·95	717,156 02
Alaska	3	101·59	95·46	1,879 88
Dental and Jewelry Scrap—				
British Columbia	457	5,211 66	4,731·52	37,545 86
Alberta	76	549·12	491·02	6,123 00
Saskatchewan	30	196·01	157·01	2,154 55
Manitoba	6	157·41	149·32	530 59
	1,618	114,041·96	107,542·52	1,850,373 74

DRAUGHTING DIVISION

H. E. Baine, Chief Draughtsman, reports:

In addition to the work for the Mines Branch, a number of page maps, drawings, charts, etc., were prepared for reports published by the Dominion Fuel Board.

The following maps were prepared during the fiscal year ending March 31, 1925:

Map No. 633, Sheet 1
" 634, " 2
" 635, " 3
" 636, " 4
" 637, " 5
" 638, " 6
" 639, " 7
" 640, " 8

} Bituminous sand, northern Alberta; scale, 1,000 feet to 1 inch.

Four sheets of east-west profiles (34 sections) showing the projected portion of bituminous sand, accompanying the above maps. Map of titaniferous iron deposits, Chicoutimi county, Quebec; prepared for Summary Report, 1924.

Maps in Hands of King's Printer

Map No. 594, Molybdenum in British Columbia, scale, 35 miles to 1 inch.
" 595, Molybdenum in Ontario, scale, 35 miles to 1 inch.
" 596, Molybdenum in Quebec and Maritime Provinces, scale, 35 miles to 1 inch.
" 613, Mineral map of Canada (extra edition).

Maps Nos. 633 to 640 (inclusive); scale, 1,000 feet to 1 inch (listed above), to be published on a scale of 40 chains to 1 inch.

One hundred and seventy-eight page maps, drawings, charts, etc., were prepared during the year.

One thousand and seventy negatives and black and white prints were made on the photostat machine.

Five hundred and sixty-eight negatives, black and white, and blue prints were supplied from the blue-print machine.

Four hundred and twenty-five half-tones, blocks, and zinc cuts were received, sent out, and filed during the year.

DISTRIBUTION OF PUBLICATIONS

G. W. Richardson reports:

During the fiscal year ending March 31, 1925, the distribution of Mines Branch reports, bulletins, memoranda series, press bulletins, lists of mine operators, etc., amounted to 74,862 copies, including 30,000 copies sent to the British Empire Exhibition. The details were as follows:

Mailing lists	23,446	
Casual requests for reports	10,468	
Casual requests for maps, bulletins, memoranda series, lists of mine operators, etc.	8,180	
Mine operators lists	2,768	
		44,862
Material Sent to British Empire Exhibition		
Lists of metallurgical works	1,500	
Lists of metal mine operators	2,000	
Lists of non-metal mine operators	2,000	
Report No. 611, "The Mineral Industries of Canada"	15,000	
Map No. 613, Mineral map of Canada	5,000	
Catalogue of Mines Branch publications	500	
Report No. 627, "The Mining Laws of Canada"	4,000	
		30,000
Total		74,862

In comparison with the report of the distribution for the previous fiscal year, there was an increase of 11,722 publications distributed in 1924-25, exclusive of the 30,000 sent to the British Empire Exhibition.

LIBRARY

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

Additions to the Library, 1924:

Books (by purchase)	343
Books (by gift)	21
Canadian Government documents (by exchange)	590
Foreign Government documents (by exchange)	770
Scientific societies, bulletins, proceedings and transactions (by exchange and gift)	670
Pamphlets (by gift)	86
Trades catalogues (by gift)	47
Maps (by exchange)	109

Four hundred and fifty volumes, including books and periodicals, were bound during the year. A few remaining copies of certain Mines Branch publications, the edition of which available for distribution has been exhausted, were bound, and with these a "Circulation Division" of the Library has been instituted. The records of investigation work contained in these reports, which are out of print, are by this means made available to many interested persons.

Valuable foreign journals have been added to the files during the year, and increased service has been rendered by the Library in connexion with translations of technical articles appearing in these journals.

EXPLOSIVES DIVISION

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

The number of licensed factories was reduced from fifteen at the commencement of the fiscal year to twelve at its conclusion, no applications having been made for the renewal of licences for the Burrowite Explosives Limited, Amherstburg, Ont., the Central Railway Signal Company, Iberville, Que., and the International Fireworks Company, London, Ont. Of the twelve, one, the Canadian Explosives Company's factory at Nobel, Ont., was not in operation, and another, that of the North Star Explosives Company, Limited, at Prescott, was, as usual, opened for only a short period, for the manufacture of fulminate of mercury. The very marked increase in production reported for 1923 has, however, been added to, over 15,000 tons of explosives of classes 1 to 4—comprising the various blasting explosives—having been made in Canadian factories.

The care taken by the managements of the several factories in the enforcement of the rules for the safe conduct of operations, the attention given by superintendents and their assistants to the inspection of equipment and to the potential dangers of the processes followed, and the intelligent cultivation of good practice on the part of employees, so that such becomes habitual, have happily combined to the benefit of all. Three fires broke out in explosives buildings and although the buildings were destroyed, the damage was localized, no serious explosion occurred, and no person was injured. Minor explosions and fires, not occasioning appreciable material damage, caused injuries to five employees in all. These recovered after comparatively short periods of treatment.

There are now two hundred and thirteen magazines under licence and one hundred and fifty-two for which temporary magazine licences have been issued, an increase in all of thirty-one. These magazines are generally well conducted and in no case has it been found necessary to take legal proceedings against a licencee in order to enforce the regulations. The magazines maintained by the manufacturers at various distributing centres are models of how magazines should be kept and operated. The condition of small magazines, in permanent locations, cared for personally by the owners, has steadily improved.

The greater attention now being paid by the supervisory staffs of public bodies and the larger users of explosives, to the operations of their magazines, has been productive of a marked improvement in them.

Satisfactory storage conditions continue to be difficult of enforcement in the case of the occasional users of explosives, and particularly when their operations on road work and the like entail their moving from place to place. In those regions which are covered by patrols of the Royal Canadian Mounted Police, such transient or occasional users can be, and are, located and instructions given and enforced. Unfortunately, in eastern Canada, and notwithstanding the great assistance rendered by the members of the Force stationed there, they are but few, and the operations undoubtedly going on and requiring small quantities of explosives are many. The activities of these, usually small, contracting parties, often come first to light when a theft or accident is reported in the local press. In country districts this may be understandable to a certain extent, but it is more difficult to account for the occurrence of such cases in cities and towns where permission may be presumed to be granted by the municipal authorities for the use of explosives before operations are commenced.

Four cases of theft from licensed magazines were reported.

Particular attention has been called in the annual report of the division to the dangers arising from small quantities of explosives being left exposed by working parties. In some cases these have been found and removed by the

police, but unfortunately a considerable percentage of the accidents to juveniles arises from playing with discarded explosives which they pick up. Three cases are also reported of large quantities of explosives having been abandoned several years previously, much of which was in a very sensitive condition. Approximately 2,500 pounds were left by a mining party in the bush, over 17,000 pounds in the magazine of a disused mine, and 900 pounds the remainder of a stock abandoned in a quarry, were collected from farmers and others. All these were destroyed.

Inspection of the dealers' premises, in which small quantities of explosives as well as safety cartridges may be kept, can be made only at long intervals, having regard to the large field to be covered. That the ground has been reasonably covered—few dealers have not at one time or another been personally instructed in regard to the regulations, and many have been visited frequently—is due to the great assistance given by the Royal Canadian Mounted Police.

In addition to making frequent tours of inspection and conducting investigations in matters relating to the enforcement of the Explosives Act, the members of the Royal Canadian Mounted Police embrace every opportunity of inspecting stores in the various localities to which their other duties lead them.

Prosecutions were instituted in seven cases for unlawful keeping of explosives, and in three for failure to keep records of receipts and issues of explosives, as required by the regulations. Convictions were obtained in all cases.

The number of permits for the importation of explosives issued during the year ending March 31 was four hundred and fifty-seven. There were also eleven special permits. These latter, for the issue of which authority was given by Order in Council,[1] are valid for the year of issue, and are granted to cover the importation of certain explosive substances required, in limited quantities, as raw materials for manufacturing purposes, but not for sale or use as explosives, or fireworks, except in respect to such articles as lights, flares, or rockets when required for use as signals in connexion with the safe movement of ships or trains, or for photographic purposes.

Seven new explosives and ninety-eight samples of fireworks were examined and authorized. Examination of samples taken from the current work of factories showed that the authorized compositions were being observed.

A detailed account of the accidents from explosives, occurring in 1924, is given in the annual report of the division. In connexion with the keeping of explosives two accidental explosions occurred, one in a store and one in a dwelling house, but fortunately without causing injury to anyone. On the other hand, to the improper keeping of explosives by a private owner must be attributed the explosion brought about by boys tampering with them, by which two of the boys were killed, and minor injuries also caused to three other members of the family. The explosive was part of that which had been taken from an abandoned quarry and is referred to above.

Accidents from use of explosives and from miscellaneous causes were slightly fewer than in the previous year. Information was obtained of fifty in mines and quarries, killing fifteen and injuring forty-seven persons, and seventy-nine elsewhere, killing seventeen and injuring seventy-five. Again, attention is to be called to the high proportion resulting from playing with explosives. Of the seventy-nine accidents elsewhere than in mines, thirty-nine were brought about in this way, causing the death of four persons, and injury to thirty-nine. With one or two exceptions the victims are children and their injuries in many cases serious—as the loss of several fingers, or a hand, or an eye. The only preventive of these distressing accidents is the keeping of explosives under lock and key. It is regrettable that, despite cautions given on the subject by public bodies and others, so many users of explosives are undoubtedly so insensitive to their responsibilities as to fail to take such obvious and reasonable precautions as would prevent the possibility of these tragedies in child life.

[1] January 23, 1925. (P.C. 110).

EDITORIAL DIVISION

L. L. Bolton, Acting Editor-in-Chief

The loss suffered by the Editorial Division by the death on March 10, 1925, of the Editor-in-Chief, the late Dr. William McInnes, is referred to at length in the report of the Acting Director of the Victoria Memorial Museum.

The duties of Editor-in-Chief were temporarily assumed, at the request of the Deputy Minister, by L. L. Bolton, Secretary, Department of Mines, on March 16, 1925.

The strength of the staff of the Editorial Division was reduced on November 1 by the retirement of J. J. Bell, Editorial Assistant. From that date G. C. Monture, Editor, Grade 2, assumed charge of the editing of publications of the Mines Branch and Annie Ainsborough was promoted to the position which became vacant by Mr. Bell's retirement. The editing of publications of the Geological Survey, and of a few other publications, was done by F. J. Nicolas, Editor, Grade 3, whose staff consisted of J. M. Loux, Assistant Editor, A. V. Moffat, Editorial Assistant, and M. M. Lister, Senior Clerk-Typist.

The translation of departmental reports from English to French was performed by Jobson Paradis, Head Translator, C. E. Rivier, Principal Translator, and P. E. Levesque, Assistant Editor. Mr. Levesque performed also the duties of Secretary to the Director, Victoria Memorial Museum and Editor-in-Chief.

During the year, F. J. Nicolas was authorized to prepare a Palæontological Index to the Publications of the Geological Survey, 1843-1916. This action was considered desirable because no index has ever been made of the numerous reports on fossils that have been published by the Survey from time to time, and to which palæontologists have occasion to refer very frequently. Good progress has been made in the compilation of this index and it should be available before the end of 1925. A General Index of Summary Reports from 1917 to 1925, and of all Memoirs and Bulletins to 1925, is contemplated, and afterwards a decennial Index to all publications of the Survey, for it is felt that these reports, consulted as they are for many years after their issue, lose a large part of their value if not scientifically indexed.

During the year several reports were edited, and a few translated, for the Dominion Fuel Board, an organization composed of permanent officials of the Department of Mines and the Department of the Interior.

In all fifty-three separate publications were issued by the department during the fiscal year, consisting of annual reports, memoirs, bulletins, pamphlets, lists, and including volume IV, part D (Lichens), volume V, part C (Botany), and volume XI, parts A (Geology) and B (Geography), of the series of reports embodying the scientific results of the Canadian Arctic Expedition 1913-1918. Eight reports were published in French.

The following list includes the publications issued by the various branches of the department during the fiscal year 1924-1925, under the supervision of the Editor-in-Chief, and the French publications distributed[1] during that period:

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

DEPARTMENT OF MINES

English Publications

Report No.

2047. *Report of the Department of Mines for the Fiscal Year Ending March 31, 1924;* 71 pages; 4,000 copies; published January 22, 1925.

French Translations

2011. *Rapport du Ministère des Mines pour l'année financière se terminant le 31 mars, 1923;* 62 pages; 1 chart; 1,000 copies; published April 23, 1924.

GEOLOGICAL SURVEY[1]

English Publications

2009. Memoir 136. Geological Series 117. *Arnprior-Quyon and Maniwaki Areas, Ontario and Quebec*—by M. E. Wilson; 152 pages; 12 plates; 17 figures; 4 maps; 2,500 copies; published April 25, 1924.

2013. Memoir 137. Geological Series 118. *Palæontology of the Silurian Rocks of Arisaig, Nova Scotia*—by F. H. McLearn; 180 pages; 30 plates; 1 figure; 2,500 copies; published July 3, 1924.

2014. Memoir 138. Geological Series 121. *Upper Ordovician Faunas of Ontario and Quebec*—by A. F. Foerste; 255 pages; 46 plates; 14 figures; 2,000 copies; published February 16, 1925.

2015. Memoir 139. Geological Series 119. *Coquihalla Area, B.C.*—by C. E. Cairnes; 187 pages; 10 plates; 8 figures; 1 map; 3,000 copies; published August 26, 1924.

2016. Memoir 140. Geological Series 122. *Physiography of Nova Scotia*—by J. W. Goldthwait; 179 pages; 38 plates; 18 figures; 1 map; 2,500 copies; published December 23, 1924.

2031. *Summary Report of the Geological Survey, Department of Mines, for the Calendar Year 1923, Part A;* 114 pages; 6 plates; 16 figures; 1 map; 3,500 copies; published August 11, 1924.

2032. Memoir 141. Geological Series 120. *Geography and Geology of Lake Melville District, Labrador Peninsula*—by E. M. Kindle; 105 pages; 17 plates; 10 figures; 2,500 copies; published December 17, 1924.

2035. *Summary Report of the Geological Survey, Department of Mines, for the Calendar Year 1923, Part B;* 115 pages; 5 plates; 13 figures; 2 maps; 3,500 copies; published September 15, 1924.

2037. *Annotated List of Economic Mineral Deposits in Canada, to accompany Mineral Map of the Dominion of Canada, 1924*—by G. A. Young; 57 pages; 1 map; 7,000 copies; published September 17, 1924.

2041. *Summary Report of the Geological Survey, Department of Mines, for the Calendar Year 1923, Part C I;* 168 pages; 9 plates; 26 figures; 2 maps; 4,000 copies; published December 13, 1924.

2042. *Summary Report of the Geological Survey, Department of Mines, for the Calendar Year 1923, Part C II;* 44 pages; 4 figures; 6 maps; 2,500 copies; published November 28, 1924.

2045. Memoir 142. Geological Series 123. *Preliminary Report on the Clay and Shale Deposits of Ontario*—by J. Keele; 176 pages; 9 plates; 11 figures; 3,500 copies; published February 9, 1925.

2051. Bulletin No. 39. Geological Series 44. *Colour Printing of Geological Maps*—by C.-O. Senécal; 4 pages; 4 coloured plates; 1,800 copies; published March 14, 1925.

Publications of the Geological Survey. List of Memoirs and Bulletins; 12 pages; 1,000 copies; published January 22, 1925.

General Guide to the Hall of Palæontology, National Museum of Canada; 3 pages, 1 figure; 3,000 copies; published July 30, 1924.

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[1] For list of publications issued by the Dominion Fuel Board in co-operation with the Geological Survey, see under "Dominion Fuel Board."

Reports of the Canadian Arctic Expedition 1913-1918[1]*:*

Volume IV: *Botany,* Part D, *Lichens*—by G. K. Merrill; 12 pages; 3,500 copies; published July 16, 1924.

Volume V: *Botany,* Part C, *General Observations on the Vegetation*—by Frits Johansen; 85 pages; 14 plates; 3,500 copies; published October 7, 1924.

Volume XI: *Geology and Geography:*

Part A, *The Geology of the Arctic Coast of Canada, West of the Kent Peninsula*—by J. J. O'Neill; 107 pages; 35 plates; 6 figures; 3 maps.

Part B, *Geographical Notes on the Arctic Coast of Canada*—by K. G. Chipman and J. R. Cox; 57 pages; 7 plates; 1 figure; same maps as for Part A.

Parts A and B bound under same cover; 4,800 copies; published July 8, 1924.

Extract of Part A, pp. 27-33, issued also as a separate: *Report on Tertiary and Quaternary Fossils from the Canadian Arctic Coast*—by W. H. Dall; 300 copies; published July 28, 1924.

French Translations

2049. Bulletin No. 34. Geological Series 41. *Physiographie et géologie glaciaire de la péninsule de Gaspé, Québec*—by A. P. Coleman; 54 pages; 7 plates; 5 figures; 1 map; 1,000 copies; published February 16, 1925.

MINES BRANCH[2]

English Publications

597. *Development of Chemical, Metallurgical, and Allied Industries in Canada in Relation to the Mineral Industry*—by Alfred W. G. Wilson; 329 pages; 12 diagrams; 3,000 copies; published December 5, 1924.

NOTE.—This report was also issued in two separate volumes:

598. Volume I, *Chemical Industries;* pp. 1-175; 10 diagrams; 5,000 copies; published October 22, 1924.

599. Volume II, *Metallurgical and Allied Industries;* pp. 177-311; 2 diagrams; 5,000 copies; published October 25, 1924.

611. *The Mineral Industries of Canada* (British Empire Exhibition Edition)—by A. H. A. Robinson with the co-operation of the Mines Branch staff; 138 pages; 35 plates; 1 map; 20,150 copies; published May 15, 1924.

The following parts of the *Summary Report of Investigations Made by the Mines Branch in 1922* issued in 1923-4, were published separately in 1924-5:

607. *Mineral Resources and Technology;* pp. 7-70; 1 plate; 3 figures; 3 diagrams; 1,000 copies; published May 2, 1924.

608. *Ore Dressing and Metallurgy;* pp. 71-193; 2 plates; 5 diagrams; 9 figures; 500 copies; published April 23, 1924.

609. *Fuels and Fuel Testing;* pp. 194-225; 2 plates; 5 figures; 3 diagrams; 500 copies; published April 23, 1924.

610. *Ceramics and Road Materials;* pp. 226-261; 500 copies; published April 23, 1924.

616a. *Natural Gas in Alberta*—by R. T. Elworthy; 35 pages; 1st edition; 500 copies; published July 29, 1924; 2nd edition, 1,000 copies, published November 19, 1924.

616. *Investigations of Mineral Resources and the Mining Industry, 1923;* 74 pages; 4,000 copies; published February 6, 1925.

617. *Investigations in Ore Dressing and Metallurgy, 1923;* 150 pages; 11 figures; 4,000 copies; published February 8, 1925.

618. *Investigations of Fuels and Fuel Testing, 1923;* 86 pages; 2 plates; 5 figures; 7 diagrams; 4,000 copies; published February 17, 1925.

619. *Investigations in Ceramics and Road Materials, 1923;* 75 pages; 1 plate; 3,500 copies; published February 28, 1925.

624. *Catalogue of Mines Branch Publications, with Alphabetical Guide;* 39 pages; 2,000 copies; published May 16, 1924.

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[1] The Arctic reports were published under the supervision of R. M. Anderson, Chief, Biological Division, Victoria Memorial Museum, as General Editor of the Arctic Publications Committee.

[2] For list of publications issued by the Dominion Fuel Board in co-operation with the Mines Branch, see under "Dominion Fuel Board."

Price List of Mines Branch Publications; 8 pages; 500 copies; published May 17, 1925.

625. *Bituminous Sands of Northern Alberta*—by Sidney C. Ells; 35 pages; 6 plates; 5,000 copies; published October 22, 1924.

626. *Bentonite*—by Hugh S. Spence; 36 pages; 16 plates; 2 figures; 4,000 copies; published November 4, 1924.

627. *The Mining Laws of Canada,* a Digest of Dominion and Provincial Laws, British Empire Exhibition Edition, 1924; 43 pages; 13,000 copies; published August 12, 1924.

Lists of Mine Operators—

List of metal mines in Canada; 3,500 copies; published April 30, 1924.
List of metallurgical works in Canada; 2,000 copies; published April 22, 1924.
List of non-metal mines in Canada; 3,500 copies; published July 29, 1924.

French Translations

550. *Rapport sur les Matériaux de Construction le long du fleuve St-Laurent, entre Prescott (Ont.) et Lachine (Qué.)*—by Joseph Keele and L. Heber Cole; 135 pages; 30 plates; 5 figures; 3 maps; 1,000 copies; published May 17, 1924.

612. *Les Industries minérales du Canada*—by A. H. A. Robinson with the co-operation of the Mines Branch staff; 152 pages; 35 plates; 1 map; 1,500 copies; published April 30, 1925.

615. *Renseignements sur la tourbe*—by B. F. Haanel; 48 pages; 5,000 copies; published August 8, 1924.

EXPLOSIVES DIVISION

English Publications

13. *Annual Report of the Explosives Division of the Department of Mines for the Calendar Year 1923;* 20 pages; 2,000 copies; published April 19, 1924.

French Translations

12. *Le Maniement des Explosifs*—by Lt.-Col. G. Ogilvie; 13 pages; 5,000 copies; published April 26, 1924.

14. *Rapport annuel de la Division des Explosifs du Ministère des Mines pour l'année civile 1923;* 20 pages; 1,000 copies; published August 20, 1924.

DOMINION FUEL BOARD

English Publications

3. *Central and District Heating, Possibilities of Application in Canada*—by F. A. Combe, (in co-operation with the Mines Branch, Publication No. 628); 79 pages; 26 figures; 5,000 copies; published December 3, 1924.

5. *Coke As a Household Fuel in Central Canada*—by J. L. Landt (in co-operation with the Mines Branch, Publication No. 630); 140 pages; 51 plates; 18 figures; 12,000 copies; published March 23, 1925.

7. *Smoky River Coal Field, Examination and Comparison with the Kananaskis Area*—by James McEvoy (in co-operation with the Geological Survey, Publication No. 2055); 19 pages; 5 plates; 3 figures; 10,000 copies; published March 6, 1925.

French Translations

4. *Chauffage central et régional, Possibilité de sa mise en pratique au Canada*—by F. A. Combe (in co-operation with the Mines Branch, Publication No. 629); 82 pages; 26 figures; 1,500 copies; published March 28, 1925.

REPORTS IN PROGRESS ON MARCH 31, 1925

At the end of the fiscal year 1924-25 there were in the hands of the King's Printer five English reports of the Geological Survey, two English reports of the Mines Branch, one English report of the Explosives Division, and the French edition of the Annual Report of the Department of Mines for the fiscal year 1923-24. Several reports were also being edited preparatory to dispatch for printing and several reports were being translated into French.

DISTRIBUTION OF FRENCH PUBLICATIONS

The French publications of the Department of Mines, including those of the Geological Survey, the Mines Branch, and the Explosives Division, are distributed by the Editorial Division of the Department, the distribution being under the direct supervision of P. E. Levesque. During the fiscal year 1923-24, 11,101 copies were distributed in Canada and foreign countries, as follows: 2,842 to addresses on the mailing lists, through the Printing Bureau Distribution Office; 4,459 copies in compliance with written or personal requests, distributed from our Distribution Office; and approximately 3,800 copies of the publications issued by the Explosives Division and the Dominion Fuel Board were sent by these offices to their correspondents.

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, 1925, were:

—	Grant	Expenditure	
		Amount	Total
	$ cts.	$ cts.	$ cts.
DEPARTMENT—			
Amount voted by Parliament	103,293 66		
Civil Government salaries		67,119 04	
Grant to Imperial Institute		12,848 00	
Expenses of Explosives Division		7,397 70	
Civil Government contingencies		4,959 13	
Grant to Canadian Institute of Mining and Metallurgy		3,000 00	
Provisional bonus allowance		1,584 66	
			96,908 53
Balance unexpended and lapsed			6,385 13
GEOLOGICAL SURVEY—			
Amounts voted by Parliament	627,488 24		
Civil list salaries		280,593 19	
Explorations, surveys, and investigations		183,236 26	
Publication of reports and maps		48,464 07	
Wages paid from Survey appropriations		29,693 06	
Sundry printing and stationery		16,015 58	
Provisional bonus allowance		6,031 57	
Miscellaneous		5,148 31	
Specimens for Museum		3,978 90	
Instruments and repairs		2,336 02	
Photographic supplies		2,117 87	
Compassionate allowance to dependent parents of late T. B. Lawlor		1,500 00	
Laboratory		946 58	
Retirement gratuity (Superannuation No. 4)		646 67	
Miscellaneous gratuities		430 00	
Advances 1924–25 to be accounted for 1925–26		1,543 55	
			582,681 63
Balance unexpended and lapsed			44,806 61
MINES BRANCH—			
Amounts voted by Parliament	620,807 33		
Civil list salaries		153,765 94	
Wages paid from Mines Branch appropriation		71,730 12	
Expenses of ore dressing and metallurgical laboratories		42,209 98	
Expenses of Dominion Fuel Board		29,445 14	
Investigation of mineral resources and deposits		24,698 81	
Publication of maps and reports		16,837 69	
Coal transportation		11,051 07	
Sundry printing and stationery		10,039 34	
Expenses of fuel testing plant and laboratories		7,708 20	
Chemical laboratory		6,518 01	
Provisional bonus allowance		4,817 33	
Miscellaneous		2,325 28	
World's Power Conference		2,089 49	
British Empire Exposition		1,188 02	
Miscellaneous gratuities		510 00	
Retirement gratuity (Superannuation No. 4)		350 00	
Advances 1924–25 to be accounted for 1925–26		232 47	
			385,516 89
Balance unexpended and lapsed			235,290 44
Forward	1,351,589 23		1,351,589 23

ACCOUNTANT'S STATEMENT—*Continued*

—	Grant	Expenditure	
		Amount	Total
	$ cts.	$ cts.	$ cts.
Forward	1,351,589 23		1,351,589 23
DOMINION OF CANADA ASSAY OFFICE—			
Amounts voted by Parliament	26,932 96		
Earnings	1,112 53		
Salaries of staff		18,918 48	
Assayers supplies		1,621 67	
Contingencies		1,286 96	
Fuel, power, and light		1,293 00	
Miscellaneous gratuities		550 00	
Premium on bonds		462 50	
Provisional bonus allowance		382 96	
Electric burglar alarm service		360 00	
			24,875 57
Balance unexpended and lapsed			3,169 92
	1,379,634 72		1,379,634 72

Summary

—	Grant	Expenditure	Grant not used
	$ cts.	$ cts.	$ cts.
Civil Government salaries	533,170 00	501,478 17	31,691 83
Department	32,549 00	28,204 83	4,344 17
Geological Survey	321,500 00	294,980 20	26,519 80
Mines Branch	450,000 00	226,073 62	223,926 38
Assay Office $ 26,000 00			
Earnings 1,112 53			
	27,112 53	23,942 61	3,169 92
Provisional bonus allowance	12,816 52	12,816 52	
Miscellaneous gratuities	1,490 00	1,490 00	
Retiring gratuity, Superannuation No. 4	996 67	996 67	
	1,379,634 72	1,089,982 62	289,652 10

Casual Revenue

Government of Saskatchewan, grant to Lignite Utilization Board	$ 31,250 00
Sales of school collections, equipment, explosives permits, etc.	4,042 86
Profits from sale of bullion and fine gold	1,899 89
Revenue from fines for violation of Explosives Act	40 00
	$ 37,232 75

INDEX