DOMINION OF CANADA

REPORT OF THE DEPARTMENT

OF

MINES AND RESOURCES

FOR THE

FISCAL YEAR ENDED MARCH 31, 1945

OTTAWA
EDMOND CLOUTIER
PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
1946

Price, 50 cents

DOMINION OF CANADA

REPORT OF THE DEPARTMENT

OF

MINES AND RESOURCES

FOR THE

FISCAL YEAR ENDED MARCH 31, 1945

OTTAWA
EDMOND CLOUTIER
PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
1946

DOMINION OF CANADA

REPORT OF THE DEPARTMENT

OF

MINES AND RESOURCES

FOR THE

FISCAL YEAR ENDED MARCH 31, 1945

CONTENTS

40806—1½

CONTENTS—*Concluded*

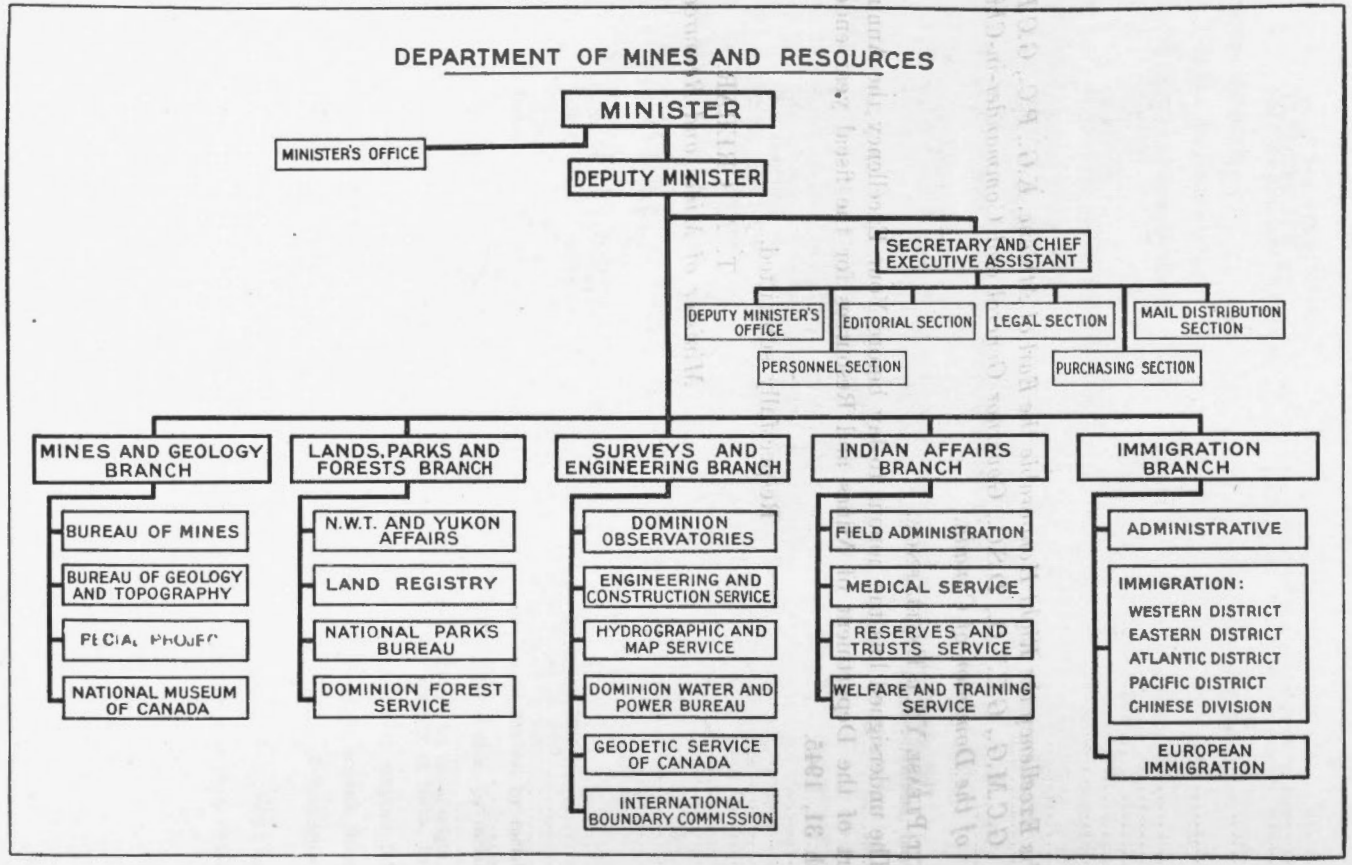
To His Excellency the Right Honourable the Earl of Athlone, K.G., P.C., G.C.B., G.C.M.G., G.C.V.O., D.S.O., Governor General and Commander-in-Chief of the Dominion of Canada.

MAY IT PLEASE YOUR EXCELLENCY:

The undersigned has the honour to lay before Your Excellency the Annual Report of the Department of Mines and Resources for the fiscal year ended March 31, 1945.

Respectfully submitted,

T. A. CRERAR,
Minister of Mines and Resources.



Organization Chart, Department of Mines and Resources.

REPORT

of the

DEPARTMENT OF MINES AND RESOURCES

FOR THE FISCAL YEAR ENDED MARCH 31, 1945

The Honourable T. A. CRERAR,
Minister of Mines and Resources,
Ottawa.

SIR,—I have the honour to submit the Ninth Annual Report of the Department of Mines and Resources.

Departmental revenues continued to show an upward trend and ordinary expenditures increased by more than one and a half million dollars. The completion of the Prince Rupert-Kitwanga Highway and other war projects reduced outlays from war appropriations by about three and a half million dollars. Little change is noted in the number of persons employed by the Department during 1944-45 as compared with the previous fiscal year.

While the various services of the Department continued to contribute to the furtherance of the war effort, plans for the full utilization of its advisory and research facilities in post-war reconstruction were well advanced. Mining and forestry, as major primary industries, will undoubtedly play leading roles in post-war projects and the Department has under consideration a widening of the services of the Department to industry. Studies were conducted of a number of subjects of immediate concern to both industries.

Matters affecting northwestern Canada continued to receive earnest attention. Geological and topographical survey parties carried on field work in both the Northwest Territories and Yukon Territory, and administrative and other measures were taken in keeping with the increased activity in these parts of the Dominion.

Scientific, engineering, and other surveys provided a fund of information on matters related to post-war activities. In anticipation of the need for post-war emergency employment, surveys were made of highway and public utilities in areas under the jurisdiction of the Department. The peace-time utilization of the greatly increased volume of power built up by war requirements is also being studied.

The efforts of the Department to increase and extend its medical and training services among the Indians continue to be handicapped by the shortage of trained personnel and a lack of hospital accommodation. The acquisition of two buildings released by the armed services will relieve to some extent the pressing need of beds for the treatment of tuberculous Indians. To the movement of service-men and other persons in the northern parts of the Dominion is attributed the outbreaks of contagious diseases among Indians in hitherto inaccessible areas.

The demand for Indian labour continued and was reflected in the improved economic conditions on most of the reserves. Farming Indians again showed gratifying progress and hunting and trapping brought fair returns. The Fur Conservation Program was further advanced as a result of the co-operation of several of the provinces.

The admission of dependants of members of the Armed Forces overseas raised to more than 15,000 the number of immigrants entering Canada in the past fiscal year. Travel to the Dominion by air increased by nearly 57 per cent.

SUMMARY OF REVENUES AND EXPENDITURES FOR THE FISCAL YEAR 1944-45

	Revenue	Expenditures Ordinary	Expenditures Special, including War	Expenditures Total Expenditures
Administrative Offices	$	$ 161,393 98	$	$ 161,393 98
Mines and Geology Branch—				
Branch Administration	99,406 91	30,276 65		
Bureau of Mines	26,450 39	429,742 14		
Bureau of Geology and Topography	4,118 76	712,551 39		
National Museum of Canada		44,501 40		
War—Miscellaneous			1,388,925 74	
	$ 129,976 06[1]	$ 1,217,071 58	$ 1,388,925 74	
				$ 2,605,997 32[2]
Lands, Parks and Forests Branch—				
Branch Administration		19,061 09		
Northwest Territories	223,702 51[3]	407,677 35	5,996 60	
Yukon Territory	78,616 17	48,495 14		
Dominion Forest Service	69,732 51	284,271 97	198,780 19	
Land Registry	89,922 22	86,512 57		
National Parks Bureau	288,756 15	1,021,553 35	168,096 98	
	$ 750,729 56	$ 1,867,571 47	$ 372,873 77	
				$ 2,240,445 24
Surveys and Engineering Branch—				
Branch Administration	0 60	21,421 70		
Dominion Observatories	347 57	120,048 96		
Dominion Water and Power Bureau	143,429 39	258,203 92	25,000 00	
Geodetic Service	99 45	135,782 48	103,380 36	
International Boundary Commission	34 20	31,997 11		
Engineering and Construction Service	1,726 75	91,629 99	3,126,409 46	
Hydrographic Service	19,288 26	735,050 85	17,215 81	
Legal Surveys and Map Service	21,623 97	216,081 29	52,562 39	
	$ 186,520 19	$ 1,610,216 30	$ 3,324,568 02	
				$ 4,934,784 32
Indian Affairs Branch—				
Branch Administration	3,281 26	52,403 07		
Indian Agencies—Administration	13,744 01	723,426 96		
Reserves and Trusts—Administration		50,353 13		
Reserves and Trusts—Fur Conservation	2,463 06		68,341 57	
Medical Services	2,475 61	2,095,826 34		
Welfare of Indians	4,861 50	800,185 33		
Indian Education	6,088 16	2,156,882 60		
Miscellaneous Statutory Items—(Annuities and Pensions)	180 25	285,163 00		
Miscellaneous Revenue—not including revenue accruing to Indian Band funds	6,697 26			
	$ 39,791 11	$ 6,164,240 43	$ 68,341 57	
				$ 6,232,582 00

SUMMARY OF REVENUES AND EXPENDITURES FOR THE FISCAL YEAR 1944-45—*Conc.*

	Revenue	Expenditures Ordinary	Special, including War	Total Expenditures
Immigration Branch—				
Administration of the Immigration Act and the Chinese Immigration Act		$ 149,168 13		
Field and Inspectional Service—Canada		1,080,818 86		
Field and Inspectional Service—Abroad		79,046 94		
Miscellaneous Statutory Items		2,010 00		
War—Miscellaneous	$ 86,073 52		$ 727,369 70	
Miscellaneous Revenue	20,080 78			
	$ 106,154 30	$ 1,311,043 93	$ 727,369 70	
				$ 2,038,413 63
Totals for Department	$ 1,213,171 22	$12,331,537 69	$ 5,882,078 80	$18,213,616 49

NOTES—

[1] Includes repayment of loans, plus interest, from the War Appropriation; and revenue from sale of equipment, supplies, and materials purchased from the War Appropriation.

[2] In addition to this amount there was expenditure by the Branch from funds made available from the War Appropriation by other Departments, a sum of $599,113.18; and an expenditure of $27,385.34 from funds made available by the Department of Fisheries.

[3] Amounts received from profits on sale of liquor and for liquor fines in the Northwest Territories are not included but are deposited to the Trust Account—Liquor Profits—N.W.T. The credit balance in that account at the close of the fiscal year was $339,096.55.

Your obedient servant,

CHARLES CAMSELL,
Deputy Minister.

MINES AND GEOLOGY BRANCH

W. B. TIMM, DIRECTOR

This report largely closes out the record of the activities of the Branch during the period of the war in Europe. Until about the middle of 1943 almost all of these activities were of direct war interest, but from then onward matters of post-war concern have been receiving increasing attention, though in the fiscal year 1944-45 the facilities of the Branch continued to be used chiefly in furtherance of the war effort.

To widen the services of the Branch to industry, plans were completed for the addition of a plastic deformation laboratory to the Physical Metallurgy Research Laboratories, which will include in its equipment, rolling mill, extrusion press, forming press, draw bench, and die-casting facilities. This will make it possible to study all stages of plastic deformation and allow for the production for testing of any type of wrought metal. Experimental foundry facilities were also added to the Laboratories. Plans and specifications were mainly completed also for a building to house an experimental hydrogenation plant and ancillary laboratories for the Fuels Division. The primary purpose of these facilities is to obtain information necessary for the design of commercial scale hydrogenation units for converting bitumen, heavy crude oil, residuums from refining, and various coals into gasoline.

A total of 187 physical metallurgical investigations were reported upon in 1944, chiefly in reference to the examination of ordnance parts. In addition, 538 reports were issued to the parties concerned in connection with routine testing to establish the quality of materials, and 43 informational memoranda were prepared for use of the war departments and organizations. Although exploratory work on gold prospects in various areas throughout Canada was exceptionally active, comparatively few gold ores were received for testing. No appreciable increase in such work is anticipated, however, until the properties concerned have reached a more advanced stage of development.

In the work on industrial minerals increasing attention was given to problems of processing and the utilization of minerals from the viewpoint of post-war requirements. Preliminary trial runs were made in December 1944 and in February 1945 in a pilot plant at Malagash, Nova Scotia, that was erected in co-operation with the Department of Fisheries, the Department of Mines, Nova Scotia, and Malagash Salt Company, to try out a process developed by the Branch for the purification of rock salt. In New Brunswick, a rock wool plant is in operation as an outcome of an investigation by the Branch of raw materials available in the Maritime Provinces.

The Fuel Research Laboratories and the services of engineers were made available for special co-operative work for the Department of National Defence. The work included the testing of a large number of samples of coals and briquettes, and of gasoline, fuel oils, and lubricating oils submitted by that Department and by the Coal and Oil Controllers, Department of Munitions and Supply. Fuel engineers also served as consultants on work for the Department of National Defence and the Coal Controller. A comprehensive directory showing typical analyses of the different sizes of coal produced at various Canadian collieries was completed and a restricted number of copies was distributed. The patented process for the promotion of clinkering in blower coals was licensed to several dealers in Quebec and Ontario. During the fiscal year

91,144 tons of coal was treated by the process. A report was prepared on a plan for the beneficiation of New Brunswick coals that it is hoped will result in the establishment of a stabilized coal industry in that province.

As a major primary industry mining will play a leading role in post-war reconstruction, and with this in mind, studies were made of such subjects as the production outlook for the gold industry; the employment outlook for the mineral industry; and reconstruction projects for post-war employment. Economic surveys of this nature and in reference to matters affecting the development, use, and conservation of Canada's mineral resources provide a valuable service, not only to industry but to other departments of Government concerned with developing and supplying markets for the products of Canadian mines and with the planning of employment projects.

In the administration of the Explosives Act, the inspection of factories making explosives for war use continued to be an important feature of the activities. A total of 28 war and commercial factories was licensed, the same number as in the previous year. F. E. Leach, who was Chief Inspector of Explosives since April 1937, retired on superannuation in November 1944.

The thirty-one geological parties assigned to field work gave their attention mainly to the investigation and mapping of possible and potential sources of oil, coal, gas, the strategic minerals, and base metals. Reconnaissance surveys over broad regions were interspersed with detailed examinations in small areas, and with systematic mapping of productive areas. Increasing use was made of geophysical principles. Several possible oil structures were outlined and valuable information was acquired in reference to coal deposits and to structural features controlling the deposition of metallic minerals. Brief statements on the purposes of the investigations and on the results obtained appear elsewhere in this report. Of special interest and importance was the printing of a new edition of the Geological Map of Canada. The previous map had long been out of print. The new edition is on a scale of 60 miles to 1 inch.

Topographical field parties operated in Yukon, the Northwest Territories, British Columbia, Alberta, Manitoba, New Brunswick, Nova Scotia, and Prince Edward Island.

The National Museum of Canada investigated the fauna and flora of areas in Yukon and Northwest Territories adjacent to the Canol Road. Valuable information on the mammals, birds, and plants of this formerly little known section of Canada was recorded. A catalogue of Canadian recent mammals was completed. It is the first comprehensive inventory of the mammal fauna of Canada.

Owing to improvement in the supply situation, no new strategic mineral projects were started. Two were closed out by repayment with interest of the loans. Work on the Abasand project in the McMurray area, Alberta, went forward steadily.

Operation of the plant for the production of secret equipment for the Naval Service was continued, the total value of output for the year being approximately $1,390,000. During the latter half of the year the demand began to decline and staff was reduced from a maximum of about 200 to about 120. The quality of the article produced has been highly commended by competent British authorities.

At the close of the fiscal year the Branch had a total of 608 permanent and temporary employees, not including 34 employees on military leave, and 10 on loan to other Departments.

SPECIAL MINERALS PROJECTS DIVISION

The Division administered funds provided from the War Appropriation for exploration and development work in connection with the supply of strategic minerals; for investigation of petroliferous deposits and potential petroliferous

areas; for the remodelling and expansion of the plant of Abasand Oils, Limited, near Fort McMurray, Alberta; and for assistance to Provincial Governments in providing transportation facilities into strategic mineral properties. The total expenditure was $1,384,642.66. All projects with reference to strategic minerals were undertaken on the recommendation of the Metals Controller and the petroliferous projects were undertaken on the recommendation of the Oil Controller.

STRATEGIC MINERALS

An allotment of $60,000 was provided for continuation of exploration and development work in connection with the supply of strategic minerals, including the administration of projects for which loans had been made previously to producers of chromite at St. Cyr, Quebec; of fluorspar in the Madoc area, Ontario; and of tungsten in Yukon. Owing to improvement in the supply position no new projects were started. Two were brought to a satisfactory conclusion by the repayment, with interest, of the loans. The projects are summarized below.

Chromite. In 1942 Chromite, Limited, operating the Sterrett mine in Cleveland township, Quebec, was given assistance in the form of a loan repayable from the sale of ore produced, to enable it to do necessary development work and to improve the milling facilities at the mine. Under the supervision of Dominion Government engineers a very satisfactory production of chromite concentrates was achieved throughout 1943 and 1944. In August 1944 the company made its final repayment of the loan, with interest, and the governing agreement was officially terminated by P.C. 6998 (September 6, 1944). During the period covered by the agreement, over 20,000 tons of chromite concentrates, 912 tons of lump ore, and 500 tons of magnetic rejects were produced and sold.

Fluorspar. Only two of the four operators of fluorspar properties in the Madoc area, Ontario, to whom Government assistance in the form of loans had been given in 1942 and 1943 operated continuously during the 1944 season. These were Reliance Fluorspar Mining Syndicate (Perry and Rogers mines) and H. C. Miller (Keene and Bailey mines). Trent Fluorspar Mining Syndicate (succeeded by Fluoroc Mines, Limited) worked intermittently on several properties in the Madoc area. The Noyes mine, formerly operated by R. T. Gilman and closed down in 1943, was not reopened. On December 15, 1944, Reliance Syndicate completed repayment of the Government loan, with interest, and governing agreements were officially terminated by P.C. 9538 (December 27, 1944). From April 1, 1944, to March 31, 1945, a total of 5,830 tons of fluorspar ore of metallurgical grade was shipped by operators who have received Government assistance through the Mines and Geology Branch.

Mica. Development of a small high-grade mica deposit near St. Michel de Wentworth, Quebec, was assisted by the leasing at low rental of a Government-owned compressor and accessories.

Tungsten. The placer claims of Vilhelm Lunde on Dublin Gulch, near Mayo, Yukon, development of which was assisted by the Government in 1943, were operated in 1944 with production of approximately 2,500 pounds of scheelite concentrates and of 104·7 fine ounces of gold. The property of Hugo A. Seaholm, in the same area, was not operated.

OIL EXPLORATIONS

Investigation of Bituminous Sand Deposits in Northern Alberta

Funds from an allotment of $145,000 provided for investigation of petroliferous deposits and of potential petroliferous areas in Canada were used for continuing the investigation of the bituminous sand deposits in northern Alberta. The program of exploratory drilling in the Horse River Reserve near Fort

McMurray, which was started early in 1944, was continued until the end of July. Fourteen holes, totalling 1,481 feet, were drilled up to March 31, 1944, and an additional thirty-four holes in the fiscal year 1944-45 brought the total for the program to 6,601 feet of drilling. A substantial amount of good grade bituminous sand was indicated on the Reserve, in which is the plant of Abasand Oils, Limited. In August the equipment of the contractor, Boyles Bros. Drilling Company, was moved to Steepbank River area about 20 miles north of Fort McMurray to do reconnaissance drilling to determine a possible southerly extension of the bituminous sand deposits indicated as a result of drilling in the area in 1943 by the Mines and Geology Branch. Twenty-four holes, totalling 4,147 feet, were drilled, but the results were disappointing. Deposition appears to have taken place under disturbed conditions, so that no additional tonnage of good grade sand can be regarded as being available. The drilling crews were dispersed during December and were reassembled early in January 1945, when a new program of closely spaced drilling in the area covered in 1943 was commenced to obtain sufficient data on which to base a more accurate estimate of the tonnage and grade of bituminous sand available for mining under reasonable depths of overburden. By the end of the fiscal year, nineteen holes, totalling 3,751 feet, had been drilled.

All of the above-mentioned drilling was done under the direct supervision of engineers of the Branch, who also made necessary surveys for locating the holes, and obtained topographic information.

Operations of Abasand Oils, Limited

The war project undertaken in April 1943 at the request of the Oil Controller to test the efficiency of methods of extracting bitumen from bituminous sand of northern Alberta, and to obtain some output of such products as asphalt, road oils, and diesel fuel, went forward steadily. The project is under the management of Abasand Oils, Limited. Although the priorities of other war undertakings caused much delay in obtaining equipment, and slowed construction, the separation plant was put into operation in June 1944. Its initial operations had to be held at a low rate, and even then filled the available tankage with bitumen before the refinery was ready for its initial run in December 1944. Wartime conditions delayed synchronization of separation, refinery, and other units, and the new plant was operated in the face of the difficulties of mining and treating frozen bituminous sands. Nevertheless, by the close of the fiscal year operating data were becoming available indicating the nature of the extraction and other problems requiring solution if steady year-round operation of a plant that will turn out commercial products is to be achieved.

Allotments for the project were $850,000 in the fiscal year 1943-44 and $1,100,000 in 1944-45. The actual expenditure on the project to March 31, 1945, was approximately $1,600,000. Not all of this is reflected in the new separation plant and the refinery, as it was necessary to make large expenditures for mining and conveying equipment; for auxiliary units such as power-house and machine shop; for housing and living accommodation; and for relocation of certain existing units to reduce the fire hazard. The inventory value of stocks on hand in the warehouse at the end of the fiscal year was approximately $160,000.

ROADS TO STRATEGIC MINERAL PROPERTIES

Dominion Government financial assistance was granted to the Ontario Government for the improvement of a road 2¾ miles long from highway 41 to the muscovite mica property of Marston Minerals, Limited, in Effingham township, Lennox and Addington county; and to the Quebec Government for the construction of a road 10 miles long from the Indian molybdenite mine in Preissac township, Abitibi county, to the main highway near Cadillac.

BUREAU OF GEOLOGY AND TOPOGRAPHY

Most of the activities of the Bureau were again directed towards assisting in the prosecution of the war.

Forty-five field parties were assigned to the investigation and mapping of potential sources of oil and strategic minerals, thirty-one of which were geological parties, and fourteen topographical. Three of the geological parties were in Northwest Territories, two in Northwest Territories and Yukon, seven in British Columbia, six in Alberta, one in Saskatchewan, two in Manitoba, two in Ontario, three in Quebec, one in Quebec and Ontario, two in New Brunswick, and two in Nova Scotia. Two of the topographical parties were in Yukon, three in Northwest Territories, one in British Columbia, three in Alberta, one in Manitoba, one in New Brunswick, two in Nova Scotia, and one in Prince Edward Island.

Twenty-seven maps were printed, of which five were geological, twenty were topographical, and two were mineral maps for the Bureau of Mines. Of great interest and importance was the completion and printing of a new edition of the Geological Map of Canada. The previous map of this kind was issued in 1924 and had long been out of print. It was on a scale of 100 miles to an inch. The new edition is on a scale of 60 miles to an inch. This, and the greatly extended range of geological information it embodies, increase its usefulness.

Thirty-nine preliminary geological papers and one geological memoir were published.

A total of 71,550 copies of reports, maps, and other publications were distributed, including copies of editions in French, and copies of publications forwarded to the Vancouver office for distribution in response to requests.

GEOLOGICAL SURVEY

Work was devoted mainly to the search for potential sources of oil, gas, coal, strategic minerals, and base metals, and to other projects associated with the war effort. Reconnaissance geological surveys over broad, unexplored regions were interspersed with intensive detailed examinations in local areas, and with systematic mapping of mining fields.

In Ottawa, special efforts were made throughout the year to facilitate the work of visiting oil geologists employed in Canada, by providing them with office accommodation and placing at their disposal the records and facilities of the Palæontological and Water Supply and Borings Sections.

Normal methods of field work were supplemented by increasing application of geophysical principles, in which the gravimeter, magnetometer, and Geiger-Muller counter were employed to advantage.

The aforementioned new geological map of the Dominion is based on the cumulative geological work of a century, and should prove of outstanding interest and value.

J. S. Stewart continued to act as liaison officer between the Department of Mines and Resources and the United States Army on the Canol Project, and as supervisory engineer for the Lands, Parks and Forests Branch of the Department on the same project. He spent the summer in the Norman Wells region, Northwest Territories, and his services were later required at Ottawa. During 1944 some thirty-two productive wells were drilled in the Norman Wells field, and the total oil production for the year was 1,229,310 barrels.

G. S. Hume continued on loan to the Oil Controller.

Field Work

NORTHWEST TERRITORIES

A. W. Jolliffe and J. D. Bateman conducted detailed geological investigations at Eldorado mine and vicinity, Great Bear Lake. These were designed to aid the discovery of pitchblende and other uranium-bearing minerals in this and neighbouring districts.

Y. O. Fortier continued geological mapping in the Ross Lake area (longitude 113° to 113° 30′, latitude 62° 30′ to 62° 45′). The area includes two zones of abundant pegmatite dykes that in places have good showings of tantalite or cassiterite. Showings of lead and zinc mineralization occur in the central-eastern part of the area, and in the north is a band of sedimentary rocks, 3 to 4 miles wide, permeated with quartz veins in which free gold occurs fairly commonly.

YUKON AND NORTHWEST TERRITORIES

E. D. Kindle investigated the geology of a strip 10 miles wide along the newly completed Canol Road for 290 miles northeast of the north end of Teslin Lake. The strip is underlain mainly by Palæozoic and older sedimentary rocks that have been intruded by many granitic stocks with which mineralization is associated. Vein deposits of barite were discovered in the course of geological mapping. Mr. Kindle and R. M. Thompson delivered a series of lectures to prospectors at Whitehorse May 23 to 27 inclusive, and at Dawson September 8 and 9.

C. O. Hage conducted a geological reconnaissance of an area in the northern plains along Liard River and adjacent to the Mackenzie Mountains. A study of the stratigraphy of the rocks exposed in the ranges at the southern end of these mountains revealed the presence of thick sections of bituminous shales and sandstones at two horizons. The upper of these corresponds in age to the oil-bearing strata of Turner Valley, and would be limited to a restricted area east and south of Mackenzie Mountains. The other and lower horizon is equivalent to that of the source beds for the Norman Wells field, and is more extensive. The search for oil-traps or structures in this area will be impeded by the widespread cover of glacial drift.

BRITISH COLUMBIA

C. S. Lord continued geological mapping in the McConnell Creek area (longitude 126° to 127°, latitude 56° to 57°). This comparatively unexplored area holds considerable promise for a variety of metalliferous deposits. Coal seams were found in rocks of two different ages.

J. E. Armstrong completed the geological mapping of the Takla area (longitude 125° to 126°, latitude 55° to 56°). This area contains the northern extension of the Pinchi Lake mercury belt, along which several discoveries have been made. A variety of other mineral occurrences are known.

J. E. Armstrong and J. B. Thurber completed the geological mapping of the Manson Creek area (longitude 124° to 125°, latitude 55° to 56°). An important, mineralized fault zone was recognized and traced for more than 40 miles. Discoveries made in the area included one of tungsten, two of copper, and several of gold.

H. M. A. Rice completed the geological mapping of the Princeton area (longitude 120° to 121°, latitude 49° to 50°). The area includes the Copper Mountain, Hedley, and several other metal mining camps, as well as the coal deposits of the Princeton and Tulameen basins.

A. F. Buckham continued, to the end of 1944, the examination of coal-bearing rocks around Nanaimo and Cumberland, Vancouver Island. During this

period Canadian Collieries (Dunsmuir), Limited, opened up a new mine in the Nanaimo district, and did considerable prospecting in the Tsable River district, near Cumberland.

W. E. Cockfield conducted several brief geological investigations in southwestern British Columbia, partly in connection with governmental engineering projects, and partly on deposits of strategic minerals.

F. H. McLearn made investigations of early Mesozoic stratigraphy in the Peace River district, for the purpose of establishing standard sections to assist the search for oil in that and adjacent areas.

ALBERTA

A. H. Lang completed the geological mapping of the Entrance area (longitude 117° 30′ to 117° 45′, latitude 53° 15′ to 53° 30′) and extended work into the adjoining Brûlé area (longitude 117° 45′ to 118°, latitude 53° 15′ to 53° 30′). Possible oil structures were outlined, and information was obtained on the probable extension of the coal seams being mined at Coalspur and vicinity.

E. J. W. Irish mapped the geology of the Pedley area (longitude 117° 15′ to 117° 30′, latitude 53° 15′ to 53° 30′). One known major anticlinal structure crosses the area. Two or more mineable coal seams are exposed on the north side of McPherson Creek, at an horizon apparently considerably higher than that of the Coalspur coal to the southeast.

O. A. Erdman completed the geological mapping of the Alexo (longitude 115° 45′ to 116°, latitude 52° 15′ to 52° 30′) and Saunders (longitude 115° 30′ to 115° 45′, latitude 52° 15′ to 52° 30′) areas. Possible oil structures were outlined, and outcrops of coal were discovered north and south of North Saskatchewan River.

J. F. Henderson mapped the Fall Creek area (longitude 115° 30′ to 115° 45′, latitude 52° to 52° 15′). Several anticlines were disclosed. Two coal seams, each more than 6 feet thick, outcrop on the bank of South Ram River.

R. A. C. Brown investigated the succession and character of Upper Palæozoic beds in several sections of the western Foothills north of Jasper, on either side of Athabaska River. This work is designed to provide information on the correlation and porosity of beds or formations encountered by drilling in the adjacent Foothills to the east.

George Shaw continued geological mapping in the Langford Creek area (longitude 114° to 114° 15′, latitude 50° to 50° 15′), and commenced work on the Callum Creek area (longitude 114° to 114° 45′ latitude 49° 45′ to 50°). Detailed structural and stratigraphic information was obtained to facilitate the search for oil in the southern Foothills.

SASKATCHEWAN

R. T. D. Wickenden examined the Herschel area (longitude 108° to 109°, latitude 51° to 52°). A soil auger was used to extend the limited outcrop information, and two holes 200 feet deep were made with a core drill to investigate the sequence of beds. One apparently high structure, such as might favour the accumulation of oil or gas, was disclosed.

MANITOBA

J. M. Harrison commenced the geological mapping of the Snow Lake area (longitude 100° to 100° 15′, latitude 54° 45′ to 55°). The area is known to contain base metals and gold deposits. Structures and rock types that control, or are favourable for, mineral deposition were given special study.

C. H. Stockwell continued the detailed study of the area about the Flin Flon and Mandy mines. This study aims to work out the structure and sequence of the volcanic rocks and their relationship to the ore deposits.

ONTARIO

T. L. Tanton made geological examinations of several localities where work was in progress on iron ore deposits, including the Helen and Josephine mines near Michipicoten, the property of Steep Rock Iron Mines at Steeprock Lake, and the Tomahawk Iron Mines in Lake township, Hastings county.

J. F. Caley continued his study and geological mapping of the Palæozoic formations in the Ontario peninsula, special attention being given to drilling results on Pelee Island, on several islands in Georgian Bay and in Lake Simcoe, and in the area between Georgian Bay and Lake Simcoe.

M. E. Wilson continued detailed examinations of fluorspar properties in the Madoc area, Hastings county.

QUEBEC

J. W. Ambrose and S. A. Ferguson mapped in detail the geology of part of the western half of Beauchastel township. Special attention was given to structural relations of the volcanic rocks along the Francœur-Arntfield, Wasa Lake, and Lake Fortune shear zones, as these have an important bearing on the search for orebodies. Information from outcrops and drill holes was supplemented in places by that from magnetometric surveys conducted by the field party.

M. E. Wilson continued detailed geological studies in Rouyn and adjacent Beauchastel townships.

G. W. H. Norman continued detailed geological mapping at the eastern end of the Cadillac belt, Abitibi county. Mapping of Louvicourt township was completed.

H. C. Cooke mapped geologically the Dudswell area (longitude 71°30′ to 72°, latitude 45°30′ to 45°45′), Eastern Townships, as part of systematic mapping of the Quebec copper belt.

NEW BRUNSWICK

F. J. Alcock completed the geological mapping of the St. George area (longitude 66° 30′ to 67°, latitude 45° to 45° 15′), and also mapped the adjacent Musquash area (longitude 66°05′ to 66°30′, latitude 45° to 45°15′). Previous geological work had been done for the Geological Survey on the St. George area in 1935 and 1936 by the late Professor S. C. Perry.

A. H. Miller of the Dominion Observatory, Surveys and Engineering Branch, continued gravimetric work for the Geological Survey in the search for buried structures favourable for the accumulation of oil and gas.

NOVA SCOTIA

L. J. Weeks completed geological mapping of the Bass River area (longitude 63°45′ to 64°, latitude 45°15′ to 45°30′). This area includes the Tennycape manganese mine. He also commenced systematic mapping of the Mira area (longitude 60° to 60°30′, latitude 45°45′ to 46°) in Cape Breton Island.

W. A. Bell mapped geologically the Shinimikas area (longitude 63°45′ to 64°, latitude 45° 45′ to 46°) in which salt deposits are probably present. He also visited Newfoundland during the latter part of August, on loan to the Newfoundland Government, partly to determine whether conditions are favourable for the occurrence of salt deposits in the Lower Carboniferous rocks of the Bay St. George area.

OFFICE WORK

Many reports, maps, and figures were prepared, based on the examination of strategic minerals, base metals, and on possible oil structures and petroliferous formations. Part of this work was done to meet specific requests of the Metals

Controller and the Oil Controller. Limited editions of some of the reports and maps were prepared to satisfy public requests for information. A new series of reports, entitled Geological Survey Bulletins, was initiated to provide scope for the presentation of problems encountered by geologists in the course of their field work. One report of this series, two memoirs, fifteen papers (mimeographed reports), thirty-eight preliminary maps, and seven final editions of maps were prepared for publication.

H. S. Bostock made a study of the physiography of Canada north of the 55th parallel and west of the Great Plains. The work involved an examination of more than 20,000 trimetrogon air photographs.

Preparation of an exhaustive mineral file was being advanced rapidly under the direction of A. LaRocque. The file, when completed, will contain the available published information on all occurrences of economic minerals in Canada.

F. J. Fraser made spectrographic analyses of fifty-four specimens of rocks and minerals submitted by the field staff.

Palæontological Section

Sixteen fossil collections for identification and age determinations were submitted to the section by officers of the Geological Survey on completion of their field work. In addition, eighteen collections were submitted by various oil companies prospecting in western Canada, and reports on them were made to the respective companies. Six companies took advantage of this service, and in return donated their collections to the Geological Survey.

That the value of the Section to geologists searching for oil may be further increased it is proposed to compile a number of charts illustrating the index fossils present in the rock formations of western Canada, and preliminary work to this end was engaging the attention of the staff whenever opportunity permitted.

W. A. Bell reported on fossil plant collections from Pedley, Brûlé, Saunders, Alexo, Smoky River, Entrance, and Wapiti River areas, Alberta; from Takla Lake and Peace River areas, British Columbia; and from Pelly River and Black River areas, Yukon and Northwest Territories.

F. H. McLearn reported on collections of Mesozoic invertebrates from Ram River, Mount Torrens, Brûlé, and Oldman River areas, Alberta, as well as from the Alaska Highway and other areas in northern British Columbia.

A. E. Wilson reported on collections of Palæozoic invertebrates from St. George area, New Brunswick; from Pelee Island and Lake Simcoe areas, Ontario; from the Riley-Lloyd well and from Ram River, Moberly Creek, and Wapiti River areas, Alberta; from the Alaska Highway and Vancouver Island, British Columbia; from Canol road, Yukon, and from Liard River, Northwest Territories.

R. A. C. Brown reported on collections of Palæozoic invertebrates from Brûlé, Saunders-Alexo, Smoky River, Hay River, and Berland River areas, Alberta.

J. Skillen was engaged in cataloguing the fossil collections.

Donations of fossil collections are gratefully acknowledged from the following: Anglo Canadian Oil Company, Limited; California Standard Oil Company; Imperial Oil, Limited; McColl-Frontenac Oil Company, Limited; Phillips Petroleum Company; Socony-Vacuum Exploration Company; British Columbia Department of Mines; Prof. B. F. Howell, Princeton University.

Mineralogical Section

Most of the time of the staff was devoted to the examination of strategic minerals and to answering inquiries relating to them. Approximately 5,000 specimens from all parts of Canada were examined, and 500 written reports were issued.

Several special investigations were also carried out. Eugene Poitevin made a detailed petrographic study of a large number of nepheline corundum-bearing rocks from Craigmont, Ontario. H. V. Ellsworth spent considerable time on tantalum-bearing minerals, and in preparing abstract descriptions of uranium and thorium mineral occurrences in Canada. In addition to the numerous optical and chemical tests required for the determination of minerals and rocks, ten complete chemical analyses were made by R. J. C. Fabry.

J. R. Marshall spent about a month in Ontario and Quebec collecting various minerals required for the prospector and educational collections.

Collections of minerals and rocks, comprising 59,798 specimens, were distributed, and an additional 30,000 specimens were prepared for distribution in 1945. These collections were disposed of as follows:

	Collections	Specimens
British Columbia, Yukon, and Northwest Territories.	221	7,017
Alberta	191	6,503
Saskatchewan	42	1,478
Manitoba	37	1,345
Ontario	478	17,271
Quebec	698	24,472
Maritime Provinces	38	1,399
United States	8	313

Water Supply and Borings Section

This section is concerned primarily with geological investigations pertaining to the exploration and development of Canada's resources of oil, gas, coal, and underground water supplies.

The greatly increased activity in oil exploration was evidenced by the increase in the number of inquiries received by mail for reports, maps, and allied data pertaining to various areas; and by the fact that representatives of thirty American and Canadian oil companies spent as much as several months in the Geological Survey offices examining well samples, compiling logs, and studying available reports, maps, and other data pertaining to areas from which they contemplate exploratory surveys. Several of these geologists represented major American oil companies who have recently entered Canada in the search for oil. This activity is further reflected in the great increase in the number of samples received during the year, which reached a peak of 88,352, an increase of 25,032 over the number received in 1943.

Most of the above-mentioned samples are from wildcat or exploratory wells. Of these, 80,106 samples were prepared, bringing the grand total of samples on file available for examination purposes to 869,311. They represent approximately 5,450 wells, of which 2,800 are in Alberta, 2,039 in Ontario, about 200 in Saskatchewan, 131 in New Brunswick, 114 in Quebec, 60 in the Northwest Territories, 48 in Nova Scotia, 21 in Manitoba, 15 in British Columbia, and 11 in Prince Edward Island.

The well samples received comprise the following: 58,058 from approximately two hundred wells drilled in Alberta, received through the courtesy of the

Petroleum and Natural Gas Conservation Board, Calgary; 15,317 from wells drilled in southwestern Ontario, received through the courtesy of R. B. Harkness, Natural Gas Commissioner of Ontario, Toronto; 8,996 from wells drilled in the Mackenzie River area, Northwest Territories, received through the courtesy of Imperial Oil, Limited, Norman Wells, Northwest Territories; 3,910 from wells drilled in Saskatchewan, received through the courtesy of E. Swain, Supervisor of Mines, Department of Natural Resources, Regina, and F. H. Edmunds, University of Saskatchewan, Saskatoon, Saskatchewan; 1,189 from Nova Scotia, received through the courtesy of M. G. Goudge, Deputy Inspector of Mines, Halifax, and the Lion Oil Refining Company drilling at Southwest Mabou, Nova Scotia; 552 from Prince Edward Island, obtained through the courtesy of Island Development Company, Charlottetown, Prince Edward Island; 243 from Quebec, received through the courtesy of I. W. Jones, Chief, Geological Surveys Branch, Quebec, and Continental Petroleums, Limited, Montreal; and 87 from Manitoba. Diamond-drill cores were also received from three hundred test holes drilled in the bituminous sand deposits of Athabaska River near Fort McMurray.

Special thanks are due to the officials of the Petroleum and Natural Gas Conservation Board of Alberta, in which province over 90 per cent of the total wells being drilled for oil occur, for co-operation in forwarding regularly well samples, core samples, drilling progress reports, interim geological reports, correlation tables, and special maps showing the locations of wells drilled. Acknowledgment is also made to F. H. Edmunds for geological logs pertaining to many test holes and shot holes drilled in Saskatchewan during the year, and to Max Littlefield, Gulf Oil Corporation, for a gift of 450 samples representing three outcrop sections made with great detail in the Jasper-Brazeau and Banff areas of Alberta.

The importance of underground water studies has been emphasized by the numerous requests made during the past year by various Government departments, industrial companies, military establishments, and municipalities for information pertaining to underground water supplies. Some of these are related to post-war development plans, but most were in connection with the drought conditions during the summer of 1944. Answers to the requests were made possible largely through the mass of published and unpublished data available through the work of previous years, including the logs of about 125,000 water wells, but several requests necessitated special field investigations. In compliance with a request from the Canadian section of the American Water Works Association, B. R. MacKay represented the Geological Survey at the Annual Meeting held at Niagara Falls, April 19-21, 1944, at which he presented a paper on the geological aspects of Canada's groundwater resources.

The increased demand for underground water information led to the appointment of a Departmental Committee to advise as to what additional work should be undertaken, and to co-ordinate any groundwater investigations made by the Geological Survey with those of the Dominion Water and Power Bureau in connection with its work in keeping records of surface water.

British Columbia Office

A total of 3,713 visitors registered at the office, and many additional inquiries were handled by mail and telephone. A total of 3,462 reports and 1,189 separate maps were issued in response to requests from the public. Determinations were also made of a large number of rock and mineral specimens.

TOPOGRAPHICAL SURVEY

The Topographical Survey made original surveys for ground and air mapping and prepared maps therefrom; and compiled and prepared base maps for use in the development of the mineral and other natural resources.

FIELD WORK

Officer in charge	Sheet name	Sheet number	Latitude and longitude	Scale of publication
R. J. Parlee	Dezadeash	115A	60° 00′– 61° 00′ 136° 00′–138° 00′	1 in. to 4 mi.
A. C. Tuttle	Whitehorse	105D	60° 00′– 61° 00′ 134° 00′–136° 00′	1 in. to 4 mi.
A. M. Floyd	Bennett	104M	59° 00′– 60° 00′ 134° 00′–136° 00′	1 in. to 4 mi.
J. A. Macdonald	Dalchurst	83 F/11, E. ½	53° 30′– 53° 45′ 117° 15′–118° 00′	1 in. to 1 mi.
	Barbara Creek Gregg Lake	83 F/12, W. ½	53° 30′– 53° 45′ 117° 15′–118° 00′	1 in. to 1 mi.
M. E. Nidd	Moberly Creek	83 E/9, E. ½	53° 30′– 53° 45′ 118° 00′–118° 30′	1 in. to 1 mi.
	Moon Creek	83 E/9, W. ½		
J. V. Butterworth	Grayling Creek	83 L/12, E. ½	54° 30′– 54° 45′ 119° 30′–120° 00′	1 in. to 1 mi.
	Chinook Creek	83 L/12, W. ½		
R. C. McDonald	File Lake	63 K/16	54° 45′– 55° 00′ 100° 00′–101° 00′	1 in. to 1 mi.
	Elbow Lake	63 K/15		
	Batty Lake	63 N/2	55° 00′– 55° 15′ 100° 30′–101° 00′	1 in. to 1 mi.
	Tramping Lake	63 K/9	54° 30′– 54° 45′ 100° 00′–100° 30′	1 in. to 1 mi.
G. A. Leonards	Newcastle	21 I/13, E. ½	46° 45′– 47° 00′ 65° 30′– 66° 00′	1 in. to 1 mi.
	Renous	21 I/13, W. ½		
	Blackville	21 I/12, W. ½	46° 30′– 46° 45′ 65° 45′– 66° 00′	1 in. to 1 mi.
J. W. March	Whycocomagh	11 F/14	45° 45′– 46° 00′ 61° 00′– 61° 30′	1 in. to 1 mi.
J. W. Spence	Earltown	11 E/11, E. ½	45° 30′– 46° 00′ 63° 00′– 63° 15′	1 in. to 1 mi.
	Cape John	11 E/14, E. ½		
	Clarksville	11 E/4, W. ½	45° 00′– 45° 15′ 63° 00′– 64° 00′	1 in. to 1 mi.
	Kennetcook	11 E/4, E. ½		
R. W. Clark	Montague	11 L/2	46° 00′– 46° 15′ 62° 30′– 63° 00′	1 in. to 1 mi.
	Mount Stewart	11 L/7	46° 15′– 46° 30′ 62° 00′– 63° 00′	1 in. to 1 mi.
	Souris	11 L/8		
H. N. Spence	Irregular areas in Cameron Bay area of Great Bear Lake on scales of 1 in. to 1,000 ft., and 1 in. to 1 mi.			
Eric Fry C. M. Duncan	Stellar observations—control for trimetrogon aerial photographs in Mackenzie basin.			

Office Work

Compilations were made from trimetrogon photographs, for publication on a scale of 1 inch to 4 miles, of 38,000 square miles in the Mackenzie River basin, N.W.T., and of 2,300 square miles in McMurray area, Alberta. This work is in manuscript form, plotted on a scale of 1 inch to 1 mile.

Eleven manuscripts were plotted from ground and air surveys and were forwarded to the map compilation section. Four of these areas are in Alberta, four in Manitoba, and three in Nova Scotia.

Nineteen projects were actively in hand at the end of the fiscal year and an additional twenty, with the planimetry completed, were held awaiting contouring in the field.

Over 1,200 prints of advance information were supplied to operating companies and Provincial Government departments.

Flight maps and related data for R.C.A.F. vertical photographic operations covering large areas were prepared.

The Map Compilation Section forwarded twelve topographical maps to the Draughting and Reproducing Division as follows: Alberta, six; Manitoba, two; Nova Scotia, four. In addition, three geological base maps of areas in Ontario, three of areas in Quebec, and one in New Brunswick, were forwarded.

The production of maps for preliminary geological papers is becoming an increasingly important part of the work, and maps and diagrams were made for 38 of these publications. A number of base maps for the use of the Geological Survey were also prepared, as well as an index and special drawings for a variety of purposes. One hundred and twenty-one projections were made.

DEVELOPMENT DIVISION

This Division is responsible for the general executive and administrative work of the Bureau; for the maintenance of the National Air Photographic Library; and for survey equipment, survey supplies, mechanical and carpentry facilities, photographic reproduction processes, and library and information services.

National Air Photographic Library

New photographs added to the library collection amounted to 59,639. Of these 1,019 were trimetrogon photographs of British Columbia and Northwest Territories, supplied by the United States Government; 25,532 were trimetrogon photographs of Northwest Territories, Yukon, British Columbia, Alberta, Saskatchewan, Manitoba, and Ontario, taken by the Royal Canadian Air Force; and the rest were vertical photographs of sections of Northwest Territories, British Columbia, Saskatchewan, Quebec, and New Brunswick. At the end of the fiscal year there were approximately 1,101,500 photographs on file in the library, covering more than 1,009,500 square miles of Canada.

The distribution and practical application of the photographs were directed wholly towards assisting projects relating to the war economy. Assistance in the selection and interpretation of aerial photographs was provided, particularly to Dominion and Provincial resources departments, to oil and mining companies, to the pulp, paper, and lumber industries, to waterpower and engineering services, to public utilities, to educational institutions, and to a variety of similar organizations engaged in development work. Altogether more than 67,000 prints of aerial photographs were purchased through the National Air Photographic Library by these organizations.

Co-operation was given to the Department of Agriculture in the study and arrangements of photographs by municipalities, for use in field investigations by engineers of the Water Development and Economics Branches established under the Prairie Farm Rehabilitation Act. Two employees of the Department of Agriculture worked under supervision of the Division.

Photographic Section

The greater part of the photography done was connected with the activities of the Bureau of Geology and Topography, but the photographic requirements of the Bureau of Mines and of the National Museum of Canada were met also. The total output showed an increase over the previous fiscal year. Most of this output was related to the topographical and geological surveys made by the Bureau and to the reproduction of topographical and geological maps. In addition, co-operation was maintained with the public, with educational institutions, and with technical and scientific journals and societies, for illustrative material of scientific and educational value.

The following is a summary of the work done:

Bromide enlargements, size 3 x 4 to 32 x 40	2,466
Contact prints, 1½ x 2½ to 36 x 48	12,805
Van Dyke prints, 14 x 17 to 35 x 47	870
Retouched negatives,	593
Dry plate negatives, 3 x 4 to 24 x 30	595
Wet plate negatives, 8 x 10 to 24 x 30	68
Van Dyke negatives, 8 x 10 to 35 x 47	101
Kodalith negatives, 5 x 7 to 24 x 30	208
Celluloid scales, 11 x 14 to 24 x 30	65
Exposures developed (field work), 11/8 x 15/8 to 5 x 7	4,215
Kodachrome colour slides	70
Lantern slides	290
Dry mounting maps and photographs	2,202

Library

A large amount of reference work was done and many inquiries were received by mail. For much of the year the Library was understaffed, resulting in large arrears of work. Constant shifting was required to use to the best advantage the limited space available. Many hundreds of volumes remain to be bound and backs are required for a great number of maps.

Bibliographical work included the checking of current serials for insertion in the supplement to the Union List of Periodicals; and the listing of Russian serials in the Library for the List of Russian Serial Publications, sponsored by the Special Libraries Association. A beginning was made in the collection of material on Triassic palæontology not available in the Library. About eighty items were located, borrowed, and photostated.

Sets of the Journal of Wildlife Preservation, Brittonia, and Bird-banding were purchased and the file of the Wilson Bulletin was brought up to date. Harvard University generously contributed a file of the Journal of American Ethnology and Archæology and completed the Varia Africana series by a gift of eight volumes. Diamond Jenness presented a set of the Memoirs of the American Ethnological Society, and Yale University presented its Publications in Anthropology. Among other institutions that sent important gifts were the Geological Society of America; Carnegie Institution of Washington; Cranbrook Institute of Science; and Carlisle Natural History Society.

The number of maps and charts received was more than double that of the preceding year. This was due to the fact that the United States Geological Survey and many other Government agencies resumed distribution.

Recorded loans were 494 higher than for the previous year. Acquisitions to the Library showed an increase of 625 over 1943-44, and were as follows:

Books acquired by purchase	97
Books (complete unbound volumes by purchase)	152
Books (by transfer, exchange, and gift)	630
Pamphlets and reprints (by gift)	240
Canadian Government documents—individual issues (by exchange and gift)	1,519
British and Foreign Government documents—individual issues (by exchange and gift)	1,307
Canadian periodicals, individual issues	627
British and foreign periodicals, individual issues	1,792
Scientific societies' bulletins, proceedings, and transactions—individual issues (by exchange and gift)	2,227
Total	9,091

Other data:

Recorded loans of books, pamphlets, periodicals	9,953
Inter-library loans	758
Books borrowed from other libraries	364
Maps and charts added to the Library	1,391
Maps and charts borrowed from the Library	449
Lantern slides loaned to educational institutions and to members of the staff	681
Photographs loaned	747
Volumes bound	219
Cards added to general catalogue	2,978
Cards added to map catalogue	370
Cards added to slide catalogue	168
Letters and cards received	1,100
Letters and cards sent	1,503

Mechanical Section

The production of photostat material totalled 11,887 square feet, as compared with 11,450 square feet in the previous year. Océ prints totalled 21,794 square feet as compared with 20,948 square feet; and blueprints totalled 338,129 square feet, as compared with 232,377 square feet. Also, 558,604 sheets of mimeographing were produced, as compared with 192,795 sheets.

The lapidary work included 62 polished specimens and 1,154 thin sections, all prepared for the furtherance of research in mineralogy.

The lecture hall and projection equipment was prepared for 157 engagements.

Equipment and Supplies Section

Camp equipment and supplies were assembled and assigned to 47 field parties of the Bureau and the National Museum. New equipment was procured to meet field requirements, damaged equipment was repaired, and outworn equipment was disposed of through official channels.

Geological Information and Distribution

Publications of the Bureau, and of the National Museum, distributed amounted to 71,550 copies, 526 of which were copies of French editions. The latter were distributed through the office of the Chief Editor, Department of Mines and Resources.

DRAUGHTING AND REPRODUCING DIVISION

Maps Published April 1, 1944, to March 31, 1945

Publication Number	Title	Remarks
	CANADA	
820A	Dominion of Canada; scale, 1 inch to 60 miles (in two sheets)	Geology. For separate distribution.
	BRITISH COLUMBIA	
792A	Chinaman Lake, Peace River District; scale, 1 inch to 1 mile	Topography. For separate distribution.
793A	Portage Mountain; Peace River District; scale, 1 inch to 1 mile	Topography. For separate distribution.
794A	Mount Hulcross, Peace River District; scale, 1 inch to 1 mile	Topography. For separate distribution.
795A	Commotion Creek, Peace River District; scale, 1 inch to 1 mile	Topography. For separate distribution.
803A	Dunlevy Creek, Peace River District; scale, 1 inch to 1 mile	Topography. For separate distribution.
	BRITISH COLUMBIA AND ALBERTA	
812	Distribution of Limestone, Southern British Columbia and Southwestern Alberta; scale 1 inch to 24 miles	Geology. For Report 811, by M. F. Goudge, and separate distribution (Bureau of Mines).
	ALBERTA	
777A	Morley, West of Fifth Meridian; scale, 1 inch to 1 mile	Geology. For Memoir 236, by H. H. Beach, and separate distribution.
798A	Glenwoodville, West of Fourth Meridian; scale, 1 inch to 1 mile	Topography. For separate distribution.
799A	Gap, West of Fifth Meridian; scale, 1 inch to 1 mile	Topography. For separate distribution.
800A	Cardston, West of Fourth Meridian; scale, 1 inch to 1 mile	Topography. For separate distribution.
801A	Mountain View, West of Fourth Meridian; scale, 1 inch to 1 mile	Topography. For separate distribution.
	SASKATCHEWAN	
784A	Cypress Lake, West of Third Meridian; scale, 1 inch to 4 miles	Geology. For memoir by G. M. Furnival, and separate distribution.

Maps published April 1, 1944, to March 31, 1945 (Continued):

Publication Number	Title	Remarks
	MANITOBA AND SASKATCHEWAN	
——	Figure 2. Graphic logs of wells, showing relationship of Palæozoic and Mesozoic formations within area mapped	Geology. For Memoir 239, by R .T. D. Wickenden.
	MANITOBA	
807A	Athapapuskow Lake, West of Principal Meridian; scale, 1 inch to 1 mile	Geology. For separate distribution.
813	Distribution of Limestone, Central and Southern Manitoba; scale, 1 inch to 20 miles	Geology. For Report 811, by M. F. Goudge, and separate distribution (Bureau of Mines).
	QUEBEC	
796A	Lac Charland, Berthier, Maskinonge, and Joliette Counties; scale, 1 inch to 1 mile	Topography. For separate distribution.
797A	Lac Maison de Pierre, Joliette, Montcalm, and Berthier Counties; scale, 1 inch to 1 mile	Topography. For separate distribution.
804A	L'Ascension, Labelle and Montcalm Counties; scale, 1 inch to 1 mile	Topography. For separate distribution.
805A	Matawin Lake, Berthier, Joliette, and Maskinonge Counties; scale, 1 inch to 1 mile	Topography. For separate distribution.
806A	Lac Franchère, Joliette and Montcalm Counties; scale, 1 inch to 1 mile	Topography. For separate distribution.
	NOVA SCOTIA	
802A	Shinimikas, Cumberland County; scale, 1 inch to 1 mile	Topography. For separate distribution.
808A	Oxford, Cumberland and Colchester Counties; scale, 1 inch to 1 mile	Topography. For separate distribution.
812A	Pugwash, Cumberland County; scale, 1 inch to 1 mile	Topography. For separate distribution.
813A	Wentworth, Cumberland and Colchester Counties; scale, 1 inch to 1 mile	Topography. For separate distribution.
817A	Malagash, Cumberland and Colchester Counties; scale, 1 inch to 1 mile	Topography. For separate distribution.
818A	Parrsboro, Cumberland and Kings Counties; scale, 1 inch to 1 mile	Topography. For separate distribution.

At the end of the year, maps of one area in Northwest Territories, twelve in Alberta, six in Manitoba, eight in Ontario, three in Quebec, four in Nova Scotia, and two in New Brunswick were in varying stages of progress.

Progress was made in the geographical and geological compilation of the geological map of the Province of Manitoba. One hundred and forty-six map and other figure drawings were prepared for reproduction by zinc-cut process for illustrating reports, articles, papers, and memoirs; other draughting and related work necessary for staff, mineral development, and public use amounted to fifty items.

Developments within the Division for post-war reconstruction purposes were studied and projected.

Geographic Board of Canada

The Geographic Board consists of fifteen members, seven of whom are officers of the Federal Government, representing the Departments of Mines and Resources and of National Defence. The others represent British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, New Brunswick, Prince Edward Island, and Nova Scotia. Quebec has its own Board to deal with geographic names in that province, but is in direct contact with the Federal Board. The Secretary of the Geographic Board of Canada is an official of the Bureau of Geology and Topography.

Owing to war conditions, no meetings of the Board were held, but the place-names for sixty maps and eighteen charts were dealt with by the Executive Committee. Many inquiries were received from the Departments of the Government and from outside.

NATIONAL MUSEUM OF CANADA

Advantage was taken of the construction of the Canol Road to investigate the fauna and flora of the adjacent area in Yukon and Northwest Territories. Valuable information on the mammals, birds, and plants of this formerly little known section of Canada was recorded and extensive collections of specimens were obtained. Miscellaneous investigations in archæology, anthropology, and folk-lore were made. This work included the attendance and observation of a representative of the Museum at Indian ceremonies connected with the erection of six totem poles at Skeena Crossing and Kitwanga, northern British Columbia.

Three reports, based on the season's field work, were completed for publication as Museum Bulletins, and one Special Contribution was issued. Forty books, articles, papers, and reviews, prepared by senior members of the staff, were published in Canada and other countries, and thirty-nine lectures were given before educational institutions and other organizations, on subjects relating to the work of the National Museum.

The annual series of Museum Lectures attracted capacity audiences, and 136 reservations of the Museum Lecture Hall were made for meetings of scientific, educational, and Government organizations. The total attendance at the Museum was recorded at 208,121, indicating sustained interest on the part of the public, despite the comparatively few exhibition halls available during the war. Museum motion picture films and lantern slides loaned for educational use were viewed by more than 65,000 persons.

The widespread co-operation and interest of other scientific organizations and of the public in the work and the upbuilding of the National Museum is gratefully acknowledged.

ANTHROPOLOGICAL DIVISION

D. Jenness, Chief of the Division, continued on loan to the Royal Canadian Air Force. He maintained connection with the work of the Division throughout the year.

C. Marius Barbeau, Ethnologist, made several visits to Montreal and Quebec for an examination of records available in institutions there of early French customs, handicrafts, and folk-lore. He arranged for a representative to attend the Indian ceremonies, lasting 2 weeks, which accompanied the erection of six totem poles at Skeena Crossing and Kitwanga, British Columbia; prepared and delivered fifteen lectures at Laval University on anthropology and folk-lore, and twenty lectures on human geography at Ottawa University; and completed for publication outside the Department, manuscripts, in book length, on Tresor des Anciens Jésuites, and Sirens of the North. One of his books was published, namely, Madones Canadiennes. He wrote two extensive summaries of the history of anthropology and folk-lore in Canada and North America for lectures requested by Montreal and Laval Universities; took about 250 photographs illustrating the ancient arts and crafts of the St. Lawrence valley; and increased by 30 items the folk-song collection of the Museum.

Douglas Leechman, Assistant Archæologist, continued the preparation of his detailed monograph on the Cape Dorset Eskimo culture. He made a short investigation of a Huron ossuary on Aylmer Island, Ontario; visited the Royal Ontario Museum in Toronto, where he studied the archæological collections; and visited Andover, Massachusetts, to make a detailed examination of important archæological material recently collected in Yukon on one of the old migration routes from Asia to America. He presented a paper on trephined skulls to the Royal Society of Canada; wrote two papers on Eskimo and Indian dwellings for *The Beaver*, and two on the Indians of Eastern Canada for *Queen's Quarterly*. He did research work on the distribution of rubbed slate implements in south-western Ontario, and was preparing a paper on this subject. His paper on the economic value of natural history museums was in course of preparation. He prepared a detailed report on the present and future needs of the National Museum of Canada and a plan for its reorganization; continued the compilation of archæological data; and answered a large number of inquiries by letter and in interviews. He continued the supervision of the anthropological collections, and added about twenty items.

Grateful acknowledgment is made to the following for specimens presented:

Allan Keefer, Rockcliffe, Ont.: Dogrib Indian specimens from Fort Rae, N.W.T.
D. A. Nichols, Sorrento, B.C.: Eskimo specimens from Fort Ross, N.W.T.
L. E. Clarke, Lake Megantic, Que.: neolithic stone hammer from England.
Const. V. H. Marchant, R.C.M.P.: Eskimo specimens from Baffin Island, N.W.T.
Mrs. E. E. Stockton, Ottawa, Ont.; Kutchin Indian specimens from Yukon.
Superfluity Shop, Ottawa, Ont.: Prairie Indian moccasins.
R. T. D. Wickenden, Ottawa, Ont.: archaeological material from Saskatchewan.
C. H. D. Clarke, Toronto, Ont.: decorated grave ornament from Yukon.
H. Silver, Noranda, Que.: chipped stone arrowpoint from Nova Scotia.
Miss Kathleen Rice, Herb Lake, Man.: archæological material from Herb Lake, Man.
T. Y. Bassett, Duncan, B.C.: archæological material from Duncan, B.C.
C. O. Hage, Ottawa, Ont.: Chipped stone arrowpoint from Trout Lake, N.W.T.
Miss M. McEwen, Toronto, Ont.: Indian pottery from Castleford, Ont.
C. Smith, Ottawa, Ont.: Indian whetstone from Quyon, Que.
Mrs. Cote, Ottawa, Ont.: Western Cree beaded bags.
H. S. Bostock, Ottawa, Ont.: Two chipped stone knives from Yukon.
Women's Art Association, Toronto, Ont.: Specimens of Prairie Indian beadwork.
Miss Low, Ottawa, Ont.: Eskimo specimens from Ungava.

BIOLOGICAL DIVISION

R. M. Anderson, Chief of the Division, continued research on mammal life in Canada, as a result of which much progress was made in the revision of Canadian species and their relationship with other North American forms. He completed the "Catalogue of Canadian Recent Mammals". This is the first comprehensive inventory of the mammal fauna of Canada. It gives the systematic position and taxonomic status of every kind of mammal known to have occurred in Canada within historic times. The Catalogue lists 592 forms that can be considered as occurring in Canada in a wild state. Of these, 469 forms and 40 types are in the collection of mammals in the National Museum. For each form is given the original description, the most important synonyms, the type locality, the geographical distribution, and other pertinent data useful to scientific mammalogists, to naturalists, and to organizations and individuals interested in wild-life conservation and study.

Surveys were made by A. L. Rand and A. E. Porsild of the mammals, birds, and plants in southeast Yukon and in Northwest Territories along the Canol Road. These surveys resulted in extensive collections of specimens and notes for an area formerly comparatively inaccessible and unknown.

Reports prepared for publication included Mammal Investigations on the Canol Road; Mammals of Yukon; and Alpine Flora of the East Slope of Mackenzie Mountains, Northwest Territories. Various other reports, papers, and articles were advanced, for printing as Museum publications, or for printing in technical journals. A start was made in assembling data on the birds of Yukon, the birds of Alberta, and the mammals of Alberta.

Continued co-operation was received from other Museums and from scientists and private individuals in Canada and the United States.

A. L. Rand, Associate Zoologist, divided his time between the mammal section and the bird section. During the period May to September, he made a survey of the mammals and birds in the area in Yukon and Northwest Territories traversed by the Canol Road. This resulted in the collection of many notes and photographs, 499 mammal specimens, and 489 bird specimens.

The assembled data on the status of Canada's furbearers were brought together in a report. Progress was made in assembling records on the mammals and the birds of Alberta. A report on the Mammals of the Ottawa District was completed for publication, and similar reports on the birds of Yukon and on the birds of the Canol Road were well advanced. Considerable information was compiled and supplied to the Department of Mines and Natural Resources, Manitoba, for use as the basis of a report on the mammals and birds of that province. Various papers and reviews by A. L. Rand were published in technical journals, and lectures on the Mammals and Birds of the Northwest and on "Bird Study" were given, respectively, at one of the Museum lecture series and at the Ottawa Field-Naturalist's Club.

Notable acquisitions included an important collection of bird skins from southern Saskatchewan, donated by N. Albulet, Winnipeg, and a specimen of the extinct passenger pigeon, a mounted male in good condition, donated by Shernfold School, Ottawa.

C. L. Patch, Chief Taxidermist and Herpetologist, modelled and coloured, for exhibition, a life-size female representation of the extinct Labrador duck, and a representation of the extinct great auk. Other specimens prepared for exhibition included a long-tailed weasel, muskrat, large brown bat, and a red-breasted nuthatch.

A muskrat, skunk, weasel, white-breasted nuthatch, bluebird, and downy woodpecker, were collected and prepared for the School Loan Collection. Specimens of birds and mammals loaned for nature study in schools numbered 239.

For use in preparing future exhibition specimens, 247 cards were entered with the anatomical measurements for 192 birds and 55 mammals.

National Herbarium

A. E. Porsild, Botanist, made a survey of the flora in the vicinity of the Canol Road in Yukon and Northwest Territories. He obtained numerous ecological and taxonomical notes, soil samples, and photographs, together with 1,200 plant specimens. He named and catalogued these specimens and a collection of 302 plant specimens from the east slope of Mackenzie Mountains, contributed by V. C. Wynne-Edwards, McGill University. His report on "The Alpine Flora of the East Slope of Mackenzie Mountains" was completed for publication, and he continued work on a large monograph on the flora of southeastern Yukon, based on his field work of the previous year. Museum Special Contribution 45-1, "Emergency Food in Arctic Canada" was issued, in mimeographed form, to meet a request from the Royal Canadian Air Force for information for airmen undergoing special training in northern Canada. Its usefulness was recognized by other agencies operating in the North and several editions were necessary to meet the demand.

Two of his papers, "A Survey of the Adventitious Flora of Ivigtut in Southwest Greenland" and "The Mammals of the Mackenzie Delta" were prepared for publication in the Canadian Field-Naturalist, and a third paper, "The So-called *Woodsia alpina* in Eastern North America" was accepted for publication in Rhodora. He delivered addresses before the Ottawa Field-Naturalists' Club and the Province of Quebec Bird Society.

Mr. Porsild was a Canadian delegate at meetings of the Arctic Institute of North America, held in New York, and he made two visits to the botanical institutions of Harvard University in connection with herbarium problems.

A total of 1,453 herbarium specimens were received by exchange and 932 by donation; 807 specimens were distributed to other herbaria on exchange; and 92 specimens were loaned to, and 49 borrowed from, other herbaria.

Miss Harkness, Herbarium Assistant, mounted and inserted 4,028 herbarium specimens, bringing the total listed specimens in the National Herbarium to 171,835. She filed four issues of Gray Herbarium Index cards and prepared a check-list of plants of Jasper, Banff, and Waterton Lakes National Parks.

Accessions

The following accessions, apart from those contributed by members of the field staff of the Museum, were obtained by donations and exchange and are acknowledged with thanks:

Mammals

National Parks Bureau, Department of Mines and Resources: 1 red pup *(Vulpes fulva regalis)*, Prince Albert National Park, Saskatchewan; 1 grizzly bear (skin only), killed October 17, 1943, near summit of Rogers Pass, Glacier National Park, B.C.; 3 pronghorn antelope (*Antilocapra americana*), heads in the flesh, from Nemiskam National Park, Alberta; 3 Rungius grizzly *(Ursus canadensis rungiusi)*, female with 2 cubs, killed June 13, 1944, in Waterton Lakes National Park, Alberta; 8 Saskatchewan timber wolf *(Canis lupus)*, skulls from Prince Albert National Park, 5 males and 3 females; 1 Yellowstone big grizzly *(Ursus horribilis imperator)*, adult male, skin and skull, killed at Sherbrooke Lake, Yoho National Park, June 17, 1944.

Northwest Territories Administration, Department of Mines and Resources: 2 domestic reindeer (*Rangifer* species), adults with skin, skull, and complete skeleton, from Reindeer Station on Richards Island, Mackenzie delta, N.W.T.

Royal Canadian Mounted Police: 4 Mackenzie varying lemming (*Discrotonyx groenlandicus* subspecies), 1 adult female with 3 nearly grown young, brought out alive from Cape Kellett, Banks Island, N.W.T., in summer coat, August 21, 1944. They changed to the white winter coat later, giving opportunity to observe the animals in summer coat, in "pied" moult, as well as to study the remarkable development of large bifid front claws in winter.

Professor William T. Shaw, Fresno State College, California: 1 Richardson lemming mouse (*Synaptomys b. borealis*), from Brightsand Lake, near St. Walburg, Sask.

R. T. D. Wickenden, Ottawa: 1 skull of northern white-tailed deer (*Odocoileus virginianus borealis*), and 1 cottontail rabbit (*Sylvilagus floridanus mearnsi*), from Ottawa district.

L. T. S. Norris-Elye, Director, Manitoba Museum, Winnipeg: 1 skull of timber wolf (*Canis lupus*), from Whiteshell Forest Reserve, Man.

Corporal Downey, R.C.M.P., Ottawa: 1 big brown bat (*Eptesicus fuscus*).

George M. Douglas, Lakefield, Ontario: 2 skulls of eastern timber wolf (*Canis lupus lycaen*), from Peterborough county, Ontario.

J. Dewey Soper, Winnipeg, Manitoba: 1 young porcupine (*Erethizon dorsatum*), skin and skull, and one adult skull and one skin of coyote (*Canis latrans*), from northwestern Alberta; 1 skin and skull of dusky shrew (*Sorex obscurus*), taken in Riding Mountain National Park, Manitoba.

Lieut. Tom H. Manning, R.C.N.V.R., Ottawa: 41 skins and skulls of small mammals (Labrador lemmings, meadow mice, red squirrels, snowshoe rabbit), from northern Quebec and east coast of Hudson Bay.

Mrs. Esther W. Cates, McLean, Sask.: 1 Saskatchewan jumping mouse (*Zapus princeps minor*).

N. Albulet, Winnipeg, Manitoba: 1 white-footed mouse (*Peromyscus*), from Regina, Sask., and 3 short-tailed shrews (*Blarina brevicauda*), from Ithaca, New York.

Wayne Robinson, fish and game warden, province of Ontario, Ottawa: 1 skull of coyote or "brush wolf" (*Canis latrans*), shot by Claude Riddell, South March, Carleton county, September 12, 1944.

Rickson A. Outhet, Mont Tremblant, Que.: 1 flying squirrel (*Glaucomys sabrinis*), and 1 red squirrel (*Tamiasciurus hudsonicus*), skins with skulls.

C. H. D. Clarke, National Parks Bureau, Ottawa: 24 mammals from northwestern British Columbia and southwestern Yukon.

T. Grayson Bell, Jr., Ottawa: 1 Bonaparte's weasel (*Mustela erminea cicognanii*), from Island No. 18, Blue Sea Lake, Que.

V. L. Eardley-Wilmot, Bureau of Mines, Ottawa: 24 bats (23 *Myotis lucifugus lucifugus* and 1 *Myotis keenii septentrionalis*), collected in October 1944 in cave near Craigmont, Renfrew county, Ontario.

C. O. Hage, Bureau of Geology and Topography, Ottawa: 1 skull of northern timber wolf (*Canis lupus occidentalis*), female, from Liard River, 20 miles below mouth of South Nahanni River, N.W.T.

E. S. Richards, Supt. Gatineau National Park, Federal District Commission, Ottawa: 1 skull of coyote (*Canis latrans*), shot October 29, 1944, near Luskville, Eardley township, Gatineau county, Que., near boundary of Gatineau National Park.

Reg. Guy, Ottawa: 1 Bonaparte's weasel (*Mustela erminea cicognanii*), taken 20 miles above mouth of Gatineau River, Que.

Stuart Criddle, Treesbank, Manitoba: 2 red squirrels (*Tamiasciurus hudsonicus*), skins with skulls.

J. V. Butterworth, Bureau of Geology and Topography, Ottawa: 1 flat skin of northern mantled ground squirrel (*Citellus lateralis tescorum*), on Wapiti River, Alberta, near northern limit of range of this species.

Charles Smith, Banks Island, N.W.T.: 1 skin of unborn seal pup.

Arnold Buzzalini, Whitehorse, Yukon: 1 skull of Alaska moose (*Alces americana gigas*), from Ross River, Canol Road, young male.

Dr. Harold B. Hitchcock, Middlebury College, Vermont: 8 bats collected Feb. 25, 1945, in Fourth Chute cave, Renfrew county, Ontario, while checking for bats previously banded: 3 *Myotis Keenii septentrionalis*, 2 *Myotis subulatus leibii*, and 3 banded specimens of the big brown bat (*Eptesicus fuscus*).

Rowley Frith, Frith's Greenhouse, Ottawa: 1 New York long-tailed weasel or ermine (*Mustela frenata noveboracensis*), taken November 11, 1944, while changing from summer to winter coat. Mounted for museum exhibit.

Willis White, South March, Carleton county, Ontario: skulls of 2 large dogs killed March 15, 1945, while chasing deer near west end of Connaught Rifle Ranges. Determined as dogs by Provincial Fish and Game Department, Toronto.

St. Lawrence Paper Mills Co., Ltd., Trinity Bay, Cote Nord, Que.: 1 snowshoe rabbit (*Lepus americanus americanus*), in the flesh. Abnormal pelage, partly melanistic, coat silvery and black, largely black.

G. Turner, Fort Simpson, N.W.T.: 1 skull of adult male northern timber wolf (*Canis lupus occidentalis*), taken at mouth of Netla River, 12 miles up Liard River south of mouth of South Nahanni River, N.W.T.

R. W. Bryenton, Herb Lake, Manitoba: 1 least weasel (*Mustela rixosa rixosa*), male adult, skin with skull.

Willie LaBrie, taxidermist, Kamouraska, Que.: 1 mounted specimen of northern long-tailed ermine (*Mustela frenata occiser*). Purchased. Apparently the first authentic record of this subspecies, although it is known to occur to the Quebec and New Brunswick boundaries in northern Maine. Mr. LaBrie reported other specimens taken by local trappers.

A. L. Rand and W. H. Bryenton, obtained on field expedition along the Canol Road between Whitehorse, Yukon, and Norman Wells, Mackenzie district, N.W.T.: 499 mammals.

A. L. Rand: 2 little brown bats (*Myotis lucifugus*), carrying numbered leg bands, from Lafleche Cave, Gatineau county, Que., March 15, 1945.

C. L. Patch: 1 big brown bat (*Eptesicus fuscus*), killed in house near Kazabazua, Gatineau county, Que.

C. E. Johnson: 1 little brown bat (*Myotis lucifugus*), killed in cottage at Danford Lake, Gatineau county, Que.

Miss P. M. Hurlbert: 1 big brown bat (*Eptesicus fuscus*), picked up in National Museum, Ottawa.

A. E. Porsild: 1 skull of Atlantic walrus (*Odobenus rosmarus*), from Godthaab, West Greenland.

Birds

Richard Prette, Ottawa: 1 olive-backed thrush.
A. E. Bourguignon, Ottawa: 1 ruddy turnstone and 3 ducks.
R. M. Anderson, National Museum: 1 purple martin.
Miss Edith Roberts, Ottawa: 1 nighthawk.
Lieut. T. H. Manning, Ottawa: 12, collection from Hudson Bay.
A. L. Rand, National Museum: 489, Canol Road collection.
Joseph Yanik, Fort Reliance: 2 magpies.
N. Albulet, Winnipeg: 203, collection from Saskatchewan and Ithaca, N.Y.
James Smart, National Parks Bureau: 1 Tennessee warbler.
A. L. Goodall, Ottawa: 1 ruby-throated hummingbird.
Dr. C. H. D. Clarke, Ottawa: 14, Alaska Highway collection.
Shernfold School, Ottawa: 1 mounted passenger pigeon.
Donald Olmstead, Ottawa: 1 duck hawk.
Dr. Eugene Murphey, Augusta, Georgia: 4.
Charles Smith, Banks Island, Franklin district: 11.
A. E. Porsild, National Museum (from Greenland): 6.
W. Schofield, Petersfield, Man.: 11.
Lands, Parks and Forests Branch, Ottawa: 4.
G. G. Ommanney, Hudson Heights, Que.: 1 tree sparrow.
Dr. O. H. Hewitt, Ottawa: 5.
R. W. Tufts, Wolfville, N.S.: 1 European widgeon.
Dr. M. J. Dunbar, Ottawa: 1 robin from Greenland.
Major Allan Brooks, Okanagan Landing, B.C.: 2 house finch.
Murray Curtis, Ottawa: 1 ruffed grouse.
J. P. Levesque, Hull, Que.: 1 great-horned owl.
D. J. Blakely, National Museum, Ottawa: 9.

Plants

J. P. Anderson, Ames, Iowa: 882 plants from Alaska and Yukon (exchange).
A. J. Breitung, Tisdale, Saskatchewan: 20 plants from Saskatchewan (exchange).
J. W. Eastham, Vancouver, B.C.: 371 rare or critical plants of British Columbia.
W. Eyerdam, Seattle, Washington: 200 plants of Alaska and Washington (exchange).
Gray Herbarium, Harvard University: 112 plants of New Brunswick (exchange).
C. Heimburger, Ottawa, Ont.: 25 rare or critical plants of Ontario.
C. E. Johnson, Ottawa, Ont. (staff): cones of *Picea excelsa*.
A. Kellett, Ottawa, Ont.: photograph of *Aquilegia*.
Ernest Lepage, Rimouski, Que.: type specimen of *Calamagrostis Lepageana*.
J. A. Munro, Okanagan Landing, B.C.: 218 plants from British Columbia.
New York Botanical Garden, N.Y.: 185 plants from Rocky Mountains (exchange).
A. E. Porsild (staff): 12,000 plants from Yukon.
Geo. H. Turner, Fort Saskatchewan, Alberta: 13 *Potamogeton* from Alberta.
U.S. National Herbarium, Washington, D.C.: 54 miscellaneous plants (exchange).
V. C. Wynne-Edwards, Montreal, Que.: 302 plants from Mackenzie Mountains, N.W.T.

EDUCATIONAL WORK

National Museum educational activity did not suffer unduly through war restrictions and this service to the public was maintained at the former level.

Although the greater part of the Museum exhibits are not available due to the temporary closing of some of the exhibition halls, every effort was made to permit students and others to see and study material in such sections of the Museum as were accessible. Special educational exhibits were arranged by the scientific staff for organized study groups, one of which had an attendance of 6,500. The exhibition halls were visited by 148,852 persons, including a large number from the armed forces, and thousands of students. Other Museum activities were attended by 59,269 persons, making a total attendance of 208,121. This attendance approximated that of the previous year and indicated a sustained public interest in Museum displays and activities.

By means of correspondence, publications, motion pictures, lantern slides, and photographs, accurate and specialized knowledge on anthropology, biology, and other phases of the natural history of Canada was brought to many who could not otherwise obtain it.

One of the most popular and direct methods of spreading accurate information on these subjects is by means of motion pictures and coloured lantern slides, which were lent to Canadian educational institutions and other museums free of charge except for cost of transportation one way. Five new motion pictures were added to the loan library and a number were added as replacements of 16 mm. prints too worn from constant use to be of any value. One new loan set of slides was added during the year. Museum slides and motion pictures were seen by 67,414 persons. As this figure is compiled from attendance records supplied by borrowers it cannot be considered a complete record, for many borrowers fail to furnish figures for attendance.

A large collection of photographs that were taken by officers of the National Museum and Geological Survey furnished a basis for the Museum's service to the public. Much time was given to the selection of photographs to illustrate scientific journals, school text books, and magazine and newspaper articles published in England, the United States, and Canada, as well as to the identification of specimens and the loan of natural history material.

GEOLOGY AND MINERALOGY (Geological Survey)

Geological displays in the Museum are arranged by the Geological Survey. Exhibition work was confined to minerals. These were arranged to show what minerals are, how they occur, their crystallization forms, variations in composition, colours, and economic value.

PALÆONTOLOGY (Geological Survey)

The Palæontological Section of the Geological Survey has charge of the exhibits in the Vertebrate Hall. This Hall was rearranged under the direction of Alice E. Wilson, so as to offer better facilities for viewing the exhibits. All exhibits in the hall are vertebrates, with the exception of a fossil forest in the northeast alcove. Included in the exhibits are: fishes; amphibians, reptiles, including dinosaurs, marine reptiles, turtles, crocodiles, and flying reptiles; fossil birds; and mammals.

NATIONAL MUSEUM LECTURES

The annual series of lectures and motion picture programs attracted capacity audiences. The Lecture Committee endeavoured to place on its programs, in addition to lectures and motion pictures on natural history, a number of topics of current social interest. Following is a list of the lectures given:

A Visit to Brazil and Peru, by Stanley Lewis, Mayor of Ottawa.

The Netherlands (motion pictures).

Speaking of Food, by Laura Pepper, Chief, Consumer Service, Department of Agriculture, Ottawa.

Battle of Russia (motion pictures).

Adventures of Chico (motion picture).

A Glimpse of Mexico, by R. H. K Marett, United Kingdom Information Board, Ottawa.

Pledge to Bataan (motion picture).

Northward with Truck and Tent, by A. L. Rand, Ph.D., National Museum of Canada, Ottawa.

Recent Glimpses of Britain and the Continent, by Air Commodore W. Ewart Cockram, R.C.A.F., Ottawa.

Birds on the Home Front, by Oliver H. Hewitt, Ph.D., Chief Migratory Bird Officer for Ontario and Quebec, National Parks Bureau, Ottawa.

Adventure in the South Seas (motion picture).

Gems and Precious Stones, by John Lovell Baker, Gemologist, Henry Birks and Sons, Montreal.

The total attendance of school children on nine Saturday mornings was 9,745, and 5,824 adults attended the same number of Wednesday evening presentations.

Members of the Canadian Boy Scouts Association acted as ushers during the children's lectures and their co-operation, together with that of the Royal Canadian Mounted Police, is appreciated.

Particular acknowledgment is made of the co-operation of the local newspapers for reports of the various lectures, and of the Carnegie Library in selecting and providing lists of books related to the lecture subjects on the Museum programs. Copies of these lists were made available at the Museum to all who were interested in supplementary reading.

LECTURE HALL

The Lecture Hall was made available to scientific, educational, government, and welfare organizations, and 136 reservations were made. The Hall has a seating capacity of 598, and has equipment for showing both 35 mm. and 16 mm. films, sound and silent, and lantern slides. Approximately 387,700 feet of film were shown.

BUREAU OF MINES

Assistance to the various war departments and organizations continued to comprise most of the activities of the Bureau, though matters of post-war interest were given increasing attention, particularly in the work of the Economics Division and to a lesser extent in that of the Industrial Minerals and Fuels Divisions. The volume of war work in the Physical Metallurgy Research Laboratories was about the same as in the previous fiscal year, but projects of peacetime importance were being planned. Experimental foundry facilities were added to the equipment of these laboratories, and plans were completed for a plastic deformation laboratory and for precision creep testing. Plans and specifications were also mainly completed for a building to house an experimental hydrogenation plant and ancillary laboratories for the Fuels Division, a convenient site for the erection of which was acquired.

The growth of the buildings housing the laboratories of the Bureau has necessitated the erection of a new central heating plant.

During the fiscal year, 7,348 copies of Bureau of Mines reports, memorandum series, and lists of mines, metallurgical works, etc., were distributed, including 404 copies of reports in French.

ECONOMICS DIVISION

The Division is primarily concerned with all economic considerations affecting the development, use, and conservation of Canada's mineral resources. Its work related much less to the war minerals than in the three preceding years, and correspondingly increased attention was given to post-war mineral problems. This transition of effort reflects the Dominion's greatly improved position in the supply of war minerals.

Studies for governmental and other use were made on such subjects as: the production outlook for the Canadian gold-mining industry for the first two post-war years; the employment outlook in the Canadian mining industry for each of the first three post-war years; the post-war outlook for lead; reconstruction projects for post-war employment; the Alaska Highway as a potential aid to prospecting; and the outlook for mining in various parts of Canada.

A special investigation was made of the possibilities of obtaining increased war production of corundum in Canada. In this work an engineer spent nearly three weeks on the examination of deposits, in addition to which he made concentration and other tests and prepared a number of reports. He also made a study of the possibilities of developing a Canadian source of diatomite to supply a new domestic market for which supplies are now being imported. The result of the study was referred to the Provincial Department of Mines particularly interested.

A printed tabulated statement comprising the report of the annual survey of deliveries for consumption, by important users, of petroleum fuels in Canada for 1943 was released in August. The consolidation of the results of the surveys for the years 1940 to 1943 inclusive was completed in preparation for the publication in bulletin form of a 5-year Summary Review which will include the report of the survey for 1944. The List of Coal Mines in Canada, which, because of war conditions, has been issued annually since 1939, was again revised and published in January, giving, as of the beginning of that month, such information on each operating mine in Canada as location, name of operator, class of coal produced according to old and new classification, mine and licence number, and scale of operation. The List and the aforementioned annual survey for 1943 were of special value to the Coal Controller and to Government and other fuel-purchasing agencies. The survey for 1943 was also of value to the Royal Commission, which was then commencing its investigation of the coal industry of Canada.

The annual reviews of Canadian minerals for 1943, dealing separately with 70 minerals, were available for selective distribution in August. The list "Milling Plants in Canada, Part I, Metallics" was revised and was being printed at the end of the year. The revision of manuscript for a fifth edition of the report "The Mineral Industries of Canada," last issued in 1934, was also placed in hand.

Special reports were prepared for the assistance of the Department of National Revenue in dealing with applications for tax exemption of new mining properties under Section 89, Income War Tax Act, and Section 7 (g), Excess Profits Tax Act, and in considering questions arising from the administration of the subsections of Section 8, Income War Tax Act, authorizing tax deductions as an encouragement to prospecting and exploring for base metals, strategic minerals, and petroleum; also in dealing with problems related to depletion and depreciation allowances on mining properties. Similar reports and other material were prepared for the Minister of Mines and Resources for his use in making recommendations as to whether and which deep test oil wells should benefit under Section 8 (10), Income War Tax Act. Such reports covered 24 proposed wells for which application had been received. Other work

on mining taxation included a revision of a summary review of Dominion tax and other legislation affecting Canadian mining enterprise, and a visit by the Acting Chief of the Division on behalf of the Deputy Minister to St. Johns, Newfoundland, in response to a request from the Commission of Government there on a matter concerning mining royalties and taxation.

During the fiscal year, 922 Prospectors' Identification Cards were issued, mostly through the co-operation of the Provincial Mining Recorders, compared with 790 in the previous year. All arrangements for issuing these cards, which assist the prospector to do field work under the wartime employment and food rationing regulations, were handled by the Division, which reviewed and filed all applications. Provision was made to again issue cards in 1945.

Mineral samples examined and reported upon, some after having been analysed, included: 30 for corundum; 4 for tungsten; 5 each for molybdenum, garnet, and diatomite; and 36, mainly for gold.

Many inquiries by correspondence and personal call from prospectors, mine operators, and others in search of information pertaining to Canada's mineral resources and their development were answered.

The Chief of the Division continued on war loan to the Combined Resources and Production Board in Washington, and a senior map draughtsman to the National Research Council. Another senior member of the staff continued under assignment to the Director's Office.

Library

The Librarian reports the following additions:

Books and pamphlets ordered	227
Bureau of Mines reports added to the circulating division	6
Canadian Government documents—individual issues (by exchange and gift)	1,632
British and Foreign Government documents—individual issues (by exchange and gift)	1,289
Scientific societies' bulletins, proceedings, and transactions—individual issues (by exchange and gift)	1,360
Periodicals (other than scientific societies, Canadian, British and Foreign Government documents)—individual issues	2,751
Trade catalogues (by gift)	111
Books and pamphlets (by gift)	338
Periodicals and annuals subscribed for	221
Annuals, continuations and periodicals (by gift)	323
Cards added to the catalogue	799
Volumes bound	151
Recorded loans	7,601

METALLIC MINERALS DIVISION

Experimental foundry facilities were added to the equipment of the Physical Metallurgy Research Laboratories. Foundry problems of various kinds were studied, and particular attention was given to magnesium alloys, the immediate purpose being to increase their field of use in military equipment, and the ultimate purpose to extend the peacetime use of this metal.

Plans were completed for the addition of a plastic deformation laboratory, which will include in its equipment rolling mill, extrusion press, forming press, draw bench, and die-casting facilities. This laboratory will make it possible to study all stages of the plastic deformation process and will also allow for the production for testing of any type of wrought metal. Precision creep testing equipment was also being designed and installed, an immediate application of which will be in the work undertaken for Turbo-Research on the development of suitable alloys for use in gas-turbine engines.

The work in progress in the Physical Metallurgy Research Laboratories comprises mainly: long term research projects; solution of immediate problems; and routine testing to establish the quality of materials. Although the volume of work for the Services remained substantially the same as in the previous year, projects of peacetime importance were also being planned so that the Bureau will be able to render maximum service to the Canadian metallurgical industries.

The important investigations during the year included work on tracks for tanks and Universal carriers; on Snowmobile development and changes necessary to make it suitable for military use; on aircraft parts of many kinds (both steel and non-ferrous metals); on parts for bombs, torpedoes, and other projectiles; on welding problems; and on corrosion prevention.

Forty-one sample shipments for investigative work were received in the Ore Dressing Laboratories. Reports were prepared on 20 of these for the parties concerned; 13 were reported by letter; and 8 were carried over incompleted.

The facilities of the laboratories and the assistance of the staff were extended to Michipicoten Iron Mines, Limited, in the sintering of 25 tons of iron ore; and to New Calumet Mines, Limited, in sintering 3 tons of lead concentrate; in recovering mica and pyrite from zinc plant tailing, and in roasting zinc concentrate.

Owing to the improvement in the tungsten situation, custom work in tungsten ores was discontinued and work was confined to the treatment by roasting and magnetic separation of two concentrates previously produced in the laboratories.

A member of the staff served on the Magnesium Advisory Committee that was established to study the magnesium situation in Canada and to report to the Metals Controller.

The Chemical Laboratories received 6,682 samples, on which 24,524 determinations were made, representing approximately 45 different mineral or metal constituents.

The samples were made up as follows:

	Number of samples	Number of determinations	Per cent of samples	Per cent of determinations
Metallic mill products	2,065	6,232	30·90	25·41
Industrial Minerals Division	2,462	5,721	36·85	23·33
Division of Economics	90	158	1·35	0·65
Physical Metallurgy Research Laboratories	350	3,059	5·24	12·48
Bureau of Geology and Topography	46	216	0·69	0·88
Miscellaneous	175	671	2·62	2·74
Department of National Defence	162	1,333	2·42	5·44
Inspection Board of United Kingdom and Canada	690	2,509	10·32	10·23
British Air Commission	85	799	1·27	3·26
Department of Munitions and Supply	272	2,019	4·07	8·24
Department of Transport	21	230	0·32	0·94
National Research Council	11	108	0·17	0·44
British Admiralty Technical Mission	55	705	0·82	2·88
Fuel Testing Laboratories	20	120	0·30	0·49
Custom assays and analysis	178	644	2·66	2·59
	6,682	24,524	100·0	100·0

Total determinations..... 24,524
Total gold assays..... 1,566 Per cent of determinations.... 6·39
Total silver assays..... 294 " " .. 1·19

The Spectrographic Laboratory was moved into the quarters previously occupied by the Physical Metallurgy section, and the staff was increased by two. The rooms were provided with a system for filtering the air, and a number of special pieces of apparatus were designed and built, among them a one-metre grating spectrograph for the quantitative analysis of non-ferrous alloys. A 21-foot grating spectrograph was designed and its construction was started. It is proposed to use this primarily for steel analyses and other work that requires relatively high dispersion. During the year 147 reports were issued, incorporating the results of 642 analyses, of which 335 were quantitative and 307 were qualitative. Samples analysed were: 291 for the Bureau of Mines; 281 for the Royal Canadian Air Force; and 70 for the Royal Canadian Mounted Police.

The Mineragraphic Laboratory issued 21 reports involving the examination of 391 polished sections, 14 thin sections, and 173 hand specimens; 16 photomicrographs were taken and 183 prints were made.

List of Physical Metallurgical Investigations Reported Upon

1559. Investigation of Universal carrier track links and pins after 4,913 miles in field test. (D.M. & S.) (January 1, 1944.)
1560. An investigation of 35 per cent nickel, 15 per cent chromium alloy cast steel as used in magnesium reduction retorts. (Shawinigan Chemicals and Dominion Magnesium.) (January 11, 1944.)
1561. Determination of cooling rates of steel plates. (I.B.U.K. & C.) (January 6, 1944.)
1562. Examination of an electric stove heating element assembly. (E.D.H. Co.) (January 10, 1944.)
1563. A metallurgical examination of sections from two C.D.P. track sprocket steels. (D.M. & S.) (January 4, 1944.)
1564. Preliminary investigation of influence of longitudinal stresses on the ballistic performance of armour-piercing shot. (I.B.U.K. & C.) (January 5, 1944.)
1567. Examination of additional welded splash strips. (A.E.D.B., M. & S.) (January 7, 1944.)
1569. Examination of Bosch fuel injection valve. (D.N.D., Naval.) (January 11, 1944.)
1570. Examination of blistered aluminium alloy sheet. (D.N.D., Air.) (January 5, 1944.)
1571. Examination of two aluminium bronze test bars. (D.N.D., Air.) (January 13, 1944.)
1572. Examination of repair welding of boiler of the S.S. Joseph Dubrule, Prescott, Ontario. (S.S. Insp. Div., Dept. of Transport.) (January 18, 1944.)
1573. Investigation on the recarburizing of decarburized end connectors. (A.E.D.B., M. & S.) (January 18, 1944.)
1574. Investigation of S.A.E. 9255 bar stock for decarburization. (A.E.D.B., M. & S.) (January 19, 1944.)
1575. Examination of spacing washers from Canadian dry pin track. (A.E.D.B., M. & S.) (January 20, 1944.)
1576. Examination of Universal carrier pins made from seamy stock. (A.E.D.B., M. & S.) (January 20, 1944.)
1577. Examination of three types of Universal carrier pins. (A.E.D.B., M. & S.) (January 20, 1944.)
1578. Examination of steel bolts from Welland Ship Canal locks. (Dept. of Transport.) (January 21, 1944.)
1579. Investigation on the Canadian dry pin rivetting tip. (A.E.D.B., M. & S.) (January 21, 1944.)
1580. Examination of a cracked piston head from a Canso aircraft oleo leg. (D.N.D., Air.) (January 24, 1944.)
1581. Welded Packard Merlin engine exhaust stubs for Mosquito aircraft. (D.N.D., Air.) (January 24, 1944.)
1582. Examination of two broken anchor cable links. (D.N.D., Navy.) (January 24, 1944.)
1583. Examination of welds cut from compressed air reservoirs. (I.B.U.K. & C.) (January 24, 1944.)
1584. Corrosion of an aluminium alloy propeller dome. (D.N.D., Air.) (January 28, 1944.)
1585. Ship plate impact strength at low temperature. (D.N.D., Navy.) (January 27, 1944.)
1586. Examination of two track shoe frames. (I.B.U.K. & C.) (January 28, 1944.)
1587. Determination of extent of decarburization of three T51 track pins. (I.B.U.K. & C.) (February 2, 1944.)
1588. Examination of two pieces of 7-mm. bulletproof plate. (Shurly-Dietrich-Atkins.) (February 5, 1944.)
1589. Metallurgical examination of Universal carrier track pins, unbroken after 5,000 miles of field test. (A.E.D.B., M. & S.) (February 5, 1944.)

1590. A process research plan for Hull Iron and Steel Foundries, Ltd., Hull, Quebec. (February 7, 1944.)
1591. Investigation of corrosion of aircraft de-icer tanks. (D.N.D., Air.) (February 7, 1944.)
1592. Examination of a new cutting tool material as to possible special armour-piercing properties. (M. & S.) (February 9, 1944.)
1593. Investigation of rivetting tips for the Canadian dry pin. (Hull Iron and Steel Foundries, Ltd., Hull, Que.) (February 10, 1944.)
1594. Investigation of failure of connecting rod bolts from a Merlin XXIX aircraft engine. (D.N.D., Air.) (February 10, 1944.)
1595. Investigation on failure of S.A.P. nose pieces for 20-mm. S.A.P. incendiary ammunition. (I.B.U.K. & C.) (February 10, 1944.)
1598. Examination of manganese steel from (1) Symons cone crusher liner, (2) Dipper tooth for a shovel bucket. (Sorel Steel Foundries.) (February 10, 1944.)
1599. Comparative examination of Valentine tank track links. (A.E.D.B., M. & S.) (February 16, 1944.)
1600. Examination of Universal carrier track links and pins after 4,000 miles of field test. (A.E.D.B., M. & S.) (February 21, 1944.)
1601. Investigation of four types of Snowmobile track cleats. (A.E.D.B., M. & S.) (February 22, 1944.)
1603. Qualification tests for Stelco welding electrodes for use in ship construction. (D.N.D., Navy.) (February 23, 1944.)
1604. Examination of welded propeller shaft flange assemblies for Snowmobiles. (A.E.D.B., M. & S.) (February 25, 1944.)
1605. Examination of failed copper-lead connecting rod bearings. (A.E.D.B., M. & S.) (March 1, 1944.)
1606. Examination of electrically welded 2-inch mortar bomb tails. (I.B.U.K. & C.) (March 6, 1944.)
1607. Examination of welded feeder levers for Oerlikon gun. (D.N.D., Navy.) (March 7, 1944.)
1608. Examination of three 21-inch torpedo connecting rods. (B.A.T.M.) (March 9, 1944.)
1609. Examination of two Cornell aircraft landing gear springs. (N.R.C.) (March 21, 1944.)
1610. Examination of S.A.E. 1060 bullet-proof plate. (A.E.D.B., M. & S.) (March 20 1944.)
1611. Progress report on quenching rate research project. (P.M.R.L.) (March 18, 1944.)
1612. Investigation of some factors affecting the accuracy of Brinell hardness readings. (A.E.D.B., M. & S.) (March 13, 1944.)
1614. Examination of a Snowmobile bogie spring anchor pin. (A.E.D.B., M. & S.) (March 28, 1944.)
1615. Examination of bronze (2BB) gudgeon pin bushings. (D.N.D., Air.) (March 24, 1944.)
1617. Examination of rods turned from two pieces of heavy boiler plate. (B.C., W.M.R.B., Vancouver.) (April 1, 1944.)
1618. Quality control procedures for ammunition manufacture. (M. & S.) (April 1, 1944.)
1620. Metallurgical examination of two recoil cylinders. (D.N.D., Navy.) (April 6, 1944.)
1621. Examination of castings in Frontier 40E aluminium alloy. (D.N.D., Air.) (April 3, 1944.)
1622. Examination of a fractured 4-inch mark XIX twin cradle. (B.A.T.M.) (April 19, 1944.)
1623. Examination of steel bolts used in Snowmobile track. (A.E.D.B., M. & S.) (April 8, 1944.)
1624. Examination of welded bogie suspension bracket from Snowmobile. (A.E.D.B., M. & S.) (April 11, 1944.)
1625. Examination of connecting rod bearings from Ford vehicle C-118. (A.E.D.B., M. & S.) (April 11, 1944.)
1627. Examination of section from a stainless steel, centrifugally cast retort which had failed in service. (Shawinigan Chemicals, Ltd., Montreal.) (April 13, 1944.)
1628. Examination of a section of admiralty cable (Pattern A.P. 7048) which failed in service. (I.B.U.K. & C.) (April 17, 1944.)
1629. Examination of welded shaft and coupling plate. (Ontario Steel Products Co., Ltd.) (April 21, 1944.)
1630. Determination of residual stresses in 17-pdr. armour-piercing shot. (P.M.R.L.) (April 21, 1944.)
1631. Metallurgical examination of six NE 8620 Universal carrier track pins representative of lot field-tested in 1943. (I.B.U.K. & C.) (April 27, 1944.)
1632. Examination of an English-made P.I.A.T. bomb. (I.B.U.K. & C.) (May 1, 1944.)
1634. Metallurgical examination of Universal carrier track pins made from NE 8620 steel. (I.B.U.K. & C.) (May 3, 1944.)

1635. Metallurgical examination of three S.A.E. 3115 Universal carrier track pins to determine whether recent failures are due to substandard pins or warped track. (I.B.U.K. & C.) (May 4, 1944.)
1636. Metallurgical examination of C.D.P. track pins which failed O.A. 227 Impact Test. (I.B.U.K. & C.) (May 8, 1944.)
1637. Examination of broken rear axle pinion and damaged rear axle shaft from four wheel drive truck. (I.B.U.K. & C.) (May 8, 1944.)
1638. Investigation of the surface condition of high-manganese steel produced by Electric Steels, Limited, Cap de la Madeleine, Quebec. (I.B.U.K. & C.) (May 9, 1944.)
1639. Examination of broken Snowmobile bogie suspension brackets. (A.E.D.B., M. & S.) (May 10, 1944.)
1640. Examination of broken austenitic manganese steel cone crusher mantle. (Joliette Steel, Ltd.) (May 10, 1944.)
1641. Examination of broken austenitic manganese steel dipper tooth. (Joliette Steel, Ltd.) (May 12, 1944.)
1642. Metallurgical examination of three sizes of pivot mechanisms for Fuze No. 208. (I.B.U.K. & C.) (May 13, 1944.)
1644. Examination of T.45 steel tubing for fuselage of Anson V aircraft. (D.N.D., Air.) (May 13, 1944.)
1645. Examination of two 40-mm. brass cartridge cases. (I.B.U.K. & C.) (May 12, 1944.)
1646. Examination of 6-pdr., 7-cwt. brass cartridge cases. (I.B.U.K. & C.) (May 13, 1944.)
1647. Examination of manganese steel from a Symons cone crusher bowl liner. (Sorel Steel Foundries, Ltd.) (May 19, 1944.)
1648. Metallurgical examination of specimens from a lower racer plate, 4-inch Mk. XXIV steel castings. (B.A.T.M.) (May 13, 1944.)
1649. Investigation into the failure of the end of railway tank car, No. CGTX 9116. (Board of Transport Commissioners.) (May 25, 1944.)
1650. Metallurgical examination of Snowmobile track reinforcing cleats. (A.E.D.B., M. & S.) (May 22, 1944.)
1651. Metallurgical examination of C.D.P. track shoes to determine cause for early change in pitch. (A.E.D.B., M. & S.) (May 22, 1944.)
1652. Metallurgical examination of bottom bearing pieces for A.R.K. gyros. (B.A.T.M.) (May 22, 1944.)
1653. Metallurgical examination of ten C.D.P. track pins of low surface hardness and low impact strength. (A.E.D.B., M. & S.) (May 23, 1944.)
1655. Investigation of S.A.E. 9255 and NE 8650 steels for homogeneous Universal carrier track pins. (A.E.D.B., M. & S.) (June 1, 1944.)
1656. Metallurgical examination of a Universal carrier track pin that failed after 600 miles of field trial. (I.B.U.K. & C.) (June 1, 1944.)
1657. Investigation of oil-quenched and water-quenched S.A.E. 9255 Canadian dry track pins. (A.E.D.B., M. & S.) (June 2, 1944.)
1658. Metallurgical examination of horseshoe heel plates used for army boots. (I.B.U.K. & C.) (June 3, 1944.)
1659. Examination of gas-welded engine mounts for Anson V aircraft. (D.N.D., Air.) (June 6, 1944.)
1660. Examination of CTL-112 guide rod nuts with projection welded flanges. (A.E.D.B., M. & S.) (June 6, 1944.)
1661. Investigation of German half-track troop carrier track pin. (A.E.D.B., M. & S.) (June 8, 1944.)
1662. Metallurgical examination of steel plate from German Scout car. (A.E.D.B., M. & S.) (June 12, 1944.)
1663. Examination of a fractured steel control rod for a 4-inch Mk. XIX gun twin mounting. (B.A.T.M.) (June 13, 1944.)
1664. Examination of armoured Snowmobile wheel assembly. (I.B.U.K. & C.) (June 13, 1944.)
1665. Further investigation of 21-inch-torpedo connecting rods. (B.A.T.M.) (June 16, 1944.)
1666. Examination of "Toughard" weld metal. (A.E.D.B., M. & S.) (June 20, 1944.)
1667. Metallurgical examination of broken main leaves of springs. (Ontario Steel Products Co., Ltd.,) (June 21, 1944.)
1668. Examination of self-tapping machine screws. (D.N.D., Army.) (June 22, 1944.)
1669. Examination of some specimens of light armour plate. (A.E.D.B., M. & S.) (June 23, 1944.)
1670. Examination of an Italian track line assembly. (A.E.D.B., M. & S.) (June 26, 1944.)

1671. Metallurgical examination of T-16 Universal carrier track pins from Somerville field test. (I.B.U.K. & C.) (June 26, 1944.)
1672. Examination of Grizzly tank idler wheel. (I.B.U.K. & C.) (June 28, 1944.)
1673. Testing of magnesium alloy trench mortar base and steel trench mortar barrel with brittle lacquer coatings. (D.N.D., Army.) (July 3, 1944.)
1674. Metallurgical examination of cam shaft and injector rolls from Cummins Diesel engine. (I.B.U.K. & C.) (July 3, 1944.)
1676. Examination of defective bronze spigots and steel studs from H.M.C.S. Amherst. (D.N.D., Navy.) (July 10, 1944.)
1677. Examination of broken bolts from Snowmobile track. (A.E.D.B., M. & S.) (July 12, 1944.)
1678. Examination of armoured Snowmobile sprockets. (A.E.D.B., M. & S.) (July 14, 1944.)
1679. Examination of welds of German Scout car. (A.E.D.B., M. & S.) (July 17, 1944.)
1680. Comparative tests of joining methods for Oerlikon gun feeder levers. (D.N.D., Navy.) (July 17, 1944.)
1681. Examination of tubing for the tail unit of M.L. 2-inch mortar bomb. (I.B.U.K. & C.) (July 18, 1944.)
1682. Examination of cast manganese steel liner. (Sorel Steel Foundries.) (July 18, 1944.)
1683. Investigation to determine the cause of cracks in manganese steel castings. (Sorel Steel Foundries.) (July 19, 1944.)
1684. Examination of 12 per cent manganese steel castings. (Wm. Kennedy & Sons.) (July 19, 1944.)
1685. Investigation of silver brazing process. (Dept. of Transport.) (July 19, 1944.)
1686. Examination of welded Universal carrier track links. (A.E.D.B., M. & S.) (July 24, 1944.)
1687. Determination of Austenitic grain size in S.A.E. 9255 steel. (A.E.D.B., M. & S.) (July 25, 1944.)
1688. Examination of six Universal carrier cased pins which failed Impact test. (A.E.D.B., M. & S.) (July 25, 1944.)
1690. Examination of corroded cap from high alloy steel retort used in magnesium production. (Shawinigan Chemicals.) (July 25, 1944.)
1691. Investigation of defects in shell forgings, 6 pdr. 6 cwt. Mk. C.T/L. (I.B.U.K. & C.) (July 25, 1944.)
1692. The measurement of stresses in a new design of steel Belleville spring for 9·2-inch coast defence gun. (A.E.D.B., M. & S.) (August 1, 1944.)
1693. Examination of stainless steel exhaust stub from Canadian-built Mosquito aircraft. (D.N.D., Air.) (August 2, 1944.)
1694. Examination of manganese steel track shoe. (I.B.U.K. & C.) (August 4, 1944.)
1695. Metallurgical examination of C.D.P. track shoe and pin which had been field-tested in England. (A.E.D.B., M. & S.) (August 5, 1944.)
1696. Examination of three manganese steel track shoes. (A.E.D.B., M. & S.) (August 7, 1944.)
1697. Investigation of the influence of pouring temperature on the properties of magnesium alloy cast test bars. (Light Alloys.) (August 7, 1944.)
1698. Investigation of cause of cracking in cold-drawn tubes from "Hedgehog" projectiles. (B.A.T.M.) (September 1, 1944.)
1699. Investigation of generator base failures. (D.N.D., Army.) (August 10, 1944.)
1700. Examination of a manganese steel Traylor mantle. (Sorel Steel Foundries.) (August 12, 1944.)
1701. Investigation of homogeneous T-16 Universal carrier track pins. (A.E.D.B., M. & S.) (August 17, 1944.)
1702. Metallurgical examination of tracked Jeep pins. (I.B.U.K. & C.) (August 17, 1944.)
1703. Metallurgical examination of three spring leaves. (I.B.U.K. & C.) (August 24, 1944.)
1704. Examination of striker springs for 25-pdr. gun. (I.B.U.K. & C.) (August 24, 1944.)
1705. Examination of T.50 steel tubing. (D.N.D., Air.) (September 1, 1944.)
1706. The measurement of stresses in a new design of steel Belleville spring for 9·2-inch coast defence gun. (A.E.D.B., M. & S.) (September 5, 1944.)
1708. Investigation of the magnetic properties and iron content of samples of compass castings and copper ingots. (M. & S.) (September 8, 1944.)
1709. Comparison of furnace-normalized and induction-normalized outer tubes of PIAT Ammunition; investigation of commercially normalized PIAT outer tubes and two-inch Trench Mortar bomb tails. (I.B.U.K. & C.) (September 20, 1944.)

1710. Examination of a C.D.P. track shoe and pin from an experimental lot that had failed in test. (A.E.D.B., M. & S.) (September 14, 1944.)
1711. Examination of fractured PIAT bomb. (I.B.U.K. & C.) (September 16, 1944.)
1712. Further examination of broken Snowmobile bogie suspension brackets. (A.E.D.B., M. & S.) (September 21, 1944.)
1713. Metallurgical examination of a steel casting from Sorel Steel Foundries, Limited, Sorel, Quebec. (Sorel Steel Foundries.) (September 25, 1944.)
1714. Metallurgical examination of failed T-16 Universal carrier track links. (D.N.D., Army.) (September 26, 1944.)
1715. Armour plate cooling rates in welding. Part I—Manual Welding. (A.E.D.B., M. & S.) (October 2, 1944.)
1716. Investigation of heat of S.A.E. 3115 steel for cased Universal carrier track pins. (A.E.D.B., M. & S.) (October 3, 1944.)
1718. Examination of welded and brazed aluminium alloy sheet test specimens. (D.N.D., Air.) (October 11, 1944.)
1719. Metallurgical examination of Ford and Chevrolet exhaust valves. (A.E.D.B., M. & S.) (October 10, 1944.)
1720. Metallurgical examination of C.T.L. 875 coupling. (A.E.D.B., M. & S.) (October 14, 1944.)
1721. Further investigation of generator base castings. (D.N.D., Army.) (October 14, 1944.)
1722. Examination of fractured composite tail tubes of PIAT bomb. (I.B.U.K. & C.) (October 16, 1944.)
1723. Induction normalizing of 2-inch trench mortar bomb tail units. (I.B.U.K. & C.) (October 19, 1944.)
1724. The isothermal annealing of an A/P shot cap steel. (St. Catharines Steel Products.) (October 20, 1944.)
1725. Interim report on investigation of corrosion of Ranger aircraft sludge pluts. (D.N.D., Air.) (October 24, 1944.)
1726. Examination of magnesium alloy outer casting for tail wheel shock strut of a Mosquito aircraft. (D.N.D., Air.) (October 26, 1944.)
1727. Examination of an S.A. cam for 4-inch twin, Mk. XIX, gun mounting. (R.N.V.R., B.A.T.M.) (November 1, 1944.)
1728. Examination of 20-mm. cartridge cases. (D.N.D., Navy.) (November 1, 1944.)
1729. Examination of four samples of manganese steel. (Sorel Steel Foundries.) (November 1, 1944.)
1730. Examination of a defective manganese steel jaw plate. (Joliette Steel, Limited.) (November 1, 1944.)
1731. Examination of a manganese steel crusher toggle seat. (Sorel Steel Foundries.) (November 1, 1944.)
1732. Metallurgical examination of track link connectors. (D.N.D., Army.) (November 2, 1944.)
1733. Examination of a mine shaft hoisting steel rope. (Dominion Wire Rope and Cable Co.) (November 4, 1944.)
1734. Examination of welded and unwelded compressed-air bottles for Lancaster aircraft. (D.N.D., Air.) (November 8, 1944.)
1736. Investigation of defective boiler tubes from S.S. Kitsilano Park. (Dept. of Transport.) (November 10, 1944.)
1738. Examination of malleable iron hand grip from Oerlikon gun. (D.N.D., Navy.) (November 10, 1944.)
1739. Examination of three manganese steel castings. (Sorel Steel Foundries.) (November 11, 1944.)
1740. Examination of a broken steel shaft from a briquetting press. (Dominion Magnesium, Limited.) (November 13, 1944.)
1741. Metallurgical examination of failed carrier idler wheel. (A.E.D.B., M. & S.) (November 13, 1944.)
1742. Metallurgical examination of fractured steel aircraft bolt. (BAC, Washington.) (November 13, 1944.)
1744. Examination of steel oxygen cylinder. (Board of Transport Commissioners.) (November 15, 1944.)
1745. Investigation of chassis frame side rails of armoured truck. (I.B.U.K. & C.) (November 15, 1944.)
1746. Metallurgical examination of a 3·7 steel shell forging. (I.B.U.K. & C.) (November 15, 1944.)
1747. Impact properties of C.D.P. track pins. (A.E.D.B., M. & S.) (November 17, 1944.)
1748. Metallurgical examination of welded Inconel exhaust stub for Mosquito aircraft. (De Havilland Aircraft.) (November 18, 1944.)

1749. Metallurgical examination of two steel pots used for melting magnesium. (Dominion Magnesium.) (November 20, 1944.)
1750. Experimental heat treatment of Naval compass parts to reduce magnetic properties. (B.A.T.M.) (November 23, 1944.)
1751. Examination of twenty-four Universal carrier pins. (A.E.D.B., M. & S.) (December 1, 1944.)
1752. Metallurgical examination of flange disks for smoke generators. (I.B.U.K. & C.) (December 1, 1944.)
1754. Metallurgical examination of cast iron Vauxhall valve tappets. (I.B.U.K. & C.) (December 1, 1944.)
1755. Examination of zinc base die-cast adapter and delay holders, Bomb M.L., 2-inch illuminating. (I.B.U.K. & C.) (December 1, 1944.)
1756. Effect of risers on magnesium (A.S.T.M.-4) test bar properties. (P.M.R.L.) (December 12, 1944.)
1757. Examination of broken Snowmobile track adjusting assembly. (A.E.D.B., M. & S.) (December 7, 1944.)
1758. Metallurgical examination of two steering end ball sockets. (I.B.U.K. & C.) (December 7, 1944.)
1760. Metallurgical examination of broken left-hand idler wheel bracket. (A.E.D.B., M. & S.) (December 12, 1944.)
1761. Examination of welded tail pieces of 120-mm. mortar bombs. (D.N.D., Army.) (December 15, 1944.)
1762. Investigation of a particle of metal removed from a soldier's coveralls. (D.N.D., Army.) (December 18, 1944.)
1763. Metallurgical examination of broken Snowmobile track adjusting assembly. (A.E.D.B., M. & S.) (December 19, 1944.)
1764. Metallurgical examination of broken steel castings from Snowmobile bogie suspension bracket. (A.E.D.B., M. & S.) (December 19, 1944.)
1765. Metallurgical examination of malleable iron idler wheels. (A.E.D.B., M. & S.) (December 21, 1944.)
1766. Metallurgical examination of three Snowmobile track cross links. (I.B.U.K. & C.) (December 20, 1944.)
1767. Investigation on the reclamation of track adjuster brackets. (A.E.D.B., M. & S.) (December 23, 1944.)

List of Ore Dressing Investigations Reported Upon

1566. Tantalum ore from the Aldous showing, Preissac township, Abitibi county, Quebec. (Geol. Surv.) (June 30, 1944.)
1568. Iron ore from Lucky Strike Prospecting Syndicate, Sudbury district, Ontario. (Lucky Strike Prospecting Synd., Toronto) (Jan. 22, 1944.)
1596. Flotation tests on a zinc ore and a zinc-lead ore from Admaston township, Renfrew county, Ontario. (N. E. Gough, Toronto.) (February 11, 1944.)
1597. Concentration and cyanidation of a gold ore from Rainy River district, Ontario. (Dr. E. R. Young, Emo.) (February 12, 1944.)
1602. Flotation tests using a sample of technical secondary octyl alcohol to determine its usefulness as a flotation reagent. (London, Eng.) (February 22, 1944.)
1613. Determination of the nature of the gold in a sample of flotation tailing from O'Brien Gold Mines, Limited, Kewagama, Quebec. (March 21, 1944.)
1616. Concentration of tantalum and tin ores from the Yellowknife-Beaulieu area, Northwest Territories. (Geol. Surv.) (April 13, 1944.)
1619. Concentration tests by flotation on a sample of mill tailing from the Werner Lake Cobalt mine, Kenora, Ontario (N. B. Davis, Ottawa.) (May 13, 1944.)
1626. Concentration of ore from diamond drill cores from the Homer Group, Walsh Lake area, Yellowknife district, Northwest Territories. (Frobisher Explor. Co., Ltd., Toronto.) (April 12, 1944.)
1643. Amalgamation and concentration tests on an oxidized gold ore from the Michipicoten area, Algoma district, Ontario. (J. N. Morrison, Wawa.) (June 3, 1944.)
1654. Flotation tests on corundum tailings from Craig mine, Craigmont, Renfrew county, Ontario. (C.I.L.) (April 21, 1944.)
1675. Concentration and cyanidation tests on a sample of gold ore from the Francoeur mine, near Arntfield, Quebec. (July 11, 1944.)
1689. Concentration of specular hematite from the Mississagi area, Ontario. (Dr. R. W. Breuls, Toronto.) (July 25, 1944.)
1707. Concentration tests on a sample of molybdenite ore from the La Corne Molybdenum Project at La Corne, Quebec. (Wartime Metals Corp.) (September 7, 1944.)

1717. Concentration of a tin ore from the Regal Silver Mines, Limited, Albert Canyon, British Columbia. (A. S. MacCulloch, Vancouver.) (October 10, 1944.)
1735. Tests on gold ore from Kerr-Addison Gold Mines, Limited, Virginiatown, Ontario. (C.I.L.) (November 9, 1944.)
1737. Cyanidation tests on a gold ore from Matachewan, Ontario. (G. S. Welsh, Matachewan.) (November 10, 1944.)
1743. Flotation reagents from the Onyx Oil and Chemical Company, Limited, Montreal, Quebec. (November 13, 1944.)
1753. Flotation tests on samples of copper-nickel ore from the Lakemount mine at Hawk Junction, Ont. (F. E. Weldon, Montreal.) (December 2, 1944.)
1759. Extraction of gold in radium residue from the Radium Luminous Industries, Ltd., Toronto, Ont. (December 11, 1944.)

Forty-three information memoranda were prepared for use of the war departments and organizations. A partial list of the subjects follows:

Improvement of armour plate.
Better methods for inspection.
Joint design of Snowmobile body.
Survey of facilities presently available for utilization of magnesium.
Canadian dry track pins.
Measurement of the strength of case-hardened surfaces.
Influence of alloying elements on the position of the S-curve.
Snowmobile bogie suspension bracket.
Casting magnesium sticks.
Incendiary thermit welding and casting.
Welded steel, 3-inch mortar base plate.
Problems encountered in the inspection of S.A.A. components.
Welding retorts used in the production of magnesium.
The fracture test for determining grain size.
S-curve for armour-piercing shot.
S-curve for 5-inch armour plate.
Fatigue tests on bolts for Snowmobile track.
Effect of tin on properties of zinc-base die-casting alloys.
Lost wax casting.
Preferred technique for the electrolytic polishing and etching of aluminium.
Comparable arc welding electrode chart.
Deep freeze tests on C.D.P. tank track pins.

During the year, 538 reports were issued by the Physical Metallurgy Laboratories. These cover all routine testing to check the quality of materials, and include endurance tests on 350 samples of aircraft control cable, tensile tests on many hundreds of test specimens of steel, bronze, and magnesium, and chemical analyses of samples of various metals. The titles listed below will indicate the variety of materials dealt with in these reports.

Age-hardening of annealed aluminium alloy wires in storage. (R.C.A.F.)
Tests on materials in a mariner's compass. (B.A.T.M.)
Aluminium alloy bloom. (B.A.C.)
Critical range of bulletproof plate. (D.M. & S.)
Aluminium alloy fuzes made in England, Canada, and the United States. (B.A.T.M.)
Examination of steel forgings. (B.A.C.)
Hardenability and silicon tests on S.A.E. 9255 bar stock. (I.B.U.K. & C.)
Reinforcing cleats for Snowmobile track. (D.M. & S.)
Heat-treatment and mechanical tests on N.E. 3620 steel plate. (D.M. & S.)
Defective condenser tube. (Navy)
Fatigue tests on boiler drum weld metal. (Navy)
Snowmobile bogie lower spring anchor pin. (D.M. & S.)
Four Snowmobile track coupling links. (D.M. & S.)
Corroded aluminium alloy bracket. (R.C.A.F.)
Snowmobile sprocket. (D.M. & S.)
Lancaster aircraft undercarriage radius rod tube. (R.C.A.F.)
Hardness survey on 70-mm., face-hardened plate. (D.M. & S.)
Low-temperature impact tests on steel of S.T.A. 11 analysis. (I.B.U.K. & C.)

Inner and outer tubes of PIAT projectiles. (I.B.U.K. & C.)
Tin-coated collapsible tubes (D.M. & S.)
Examination of cracked boiler plate from SS. *Cassiar*. (D.T.)
Copper-fire-extinguisher bottles. (R.C.A.F.)
Three-inch, trench mortar barrel. (Army)
Pull tests on Snowmobile track cleats. (D.M. & S.)
Examination of case on broken pinion. (I.B.U.K. & C.)
Corroded Hoover propeller dome. (R.C.A.F.)
Measurement of stresses in a Belleville spring. (D.M. & S.)
Examination of Snowmobile suspension springs. (I.B.U.K. & C.)
Cracked, 40-mm. cartridge case. (I.B.U.K. & C.)
Hydraulic brake cylinder, Cornell aircraft. (R.C.A.F.)
Examination of pieces of armour from German bombs. (Army)
Salt spray test on stainless steel tubing. (B.A.C.)
Welds on W.D. 8650 track pins. (I.B.U.K. & C.)
Sprocket for C.D.P. track. (I.B.U.K. & C.)
Pump barrel liners (B.A.T.M.)
Examination of Universal joint. (I.B.U.K. & C.)
Sample of Babbitt metal. (D.M. & S.)
Used carrier idler wheel. (D.M. & S.)
Hardness tests on steel bullet envelopes. (I.B.U.K. & C.)
Normalizing of M.L. 3-inch mortar tail unit cartridge container (I.B.U.K. & C.)
Snowmobile track adjusting assembly. (D.M. & S.)

INDUSTRIAL MINERALS DIVISION

The activities of the Division are directed to the promotion of that part of the mineral industry concerned with production of minerals, rocks, clays, etc., used other than as sources of metal or fuel. These industrial minerals are of importance in most of the manufacturing industries and in construction. They have played an important role in the making of war materials, some of them to such an extent that they are classified as strategic minerals.

Although the production of some of these minerals may decline at the close of hostilities, that of others will doubtless increase owing to the release of manpower, the shortage of which has restricted the output of certain classes of goods, into the manufacture of which large quantities of minerals enter.

The Division deals with the resources of industrial minerals, their economic characteristics, mining, marketing, and use; the crushing, grinding, and purification of the minerals; and problems of processing in the manufacture of mineral products, particularly ceramic products. Its activities were again devoted mainly to promoting the production of those minerals of importance in the manufacture of munitions, and to services to the war departments. Increasing attention was given, however, to problems of processing and utilization of minerals from the post-war viewpoint.

Throughout the year field, laboratory, and consulting services were rendered to the Departments of National Defence, Munitions and Supply, Labour, Reconstruction, Agriculture, National Revenue, Trade and Commerce, Transport, Public Works, and to the National Research Council, Ontario Securities Commission, British Admiralty Technical Mission, and the United States War Production Board.

Information on markets in Canada or on the Canadian sources of supply of sundry industrial minerals and primary mineral products was supplied to government bureaux and industrial firms of Great Britain, Newfoundland, Union of South Africa, India, and the United States, and to many Canadian firms and individuals.

Interest in mica continued to be lively. A number of samples from Canadian mines were tested for heat-resistant properties, and two newly developed instruments for determining power factor and dielectric strength were acquired. Close co-operation was maintained with Colonial Mica Corporation, the United States Government mica-purchasing agency, and with officials of the Mica Section, United States War Production Board, to whom assistance was given in reference to an increased supply of Canadian phlogopite splittings; factors affecting the electrical quality of mica; and in various other ways. A study was made of Canadian muscovite mica to determine its suitability for marine compass dials, and a report on the subject was prepared for the information of the British Admiralty Technical Mission. Information on factors involved in the processing, standardizing, and marketing of mica was furnished to the Trade Commissioner (Toronto, Ont.) for the Government of India.

Two engineers devoted most of their time to war work, under the immediate supervision of the Director's office.

In co-operation with the Department of Fisheries, the Department of Mines of Nova Scotia, and Malagash Salt Company, Limited, a pilot plant was established at Malagash, Nova Scotia, to try out a process developed by the Division for the purification of rock salt and the production of salt suitable for fishery use. Preliminary trial runs were made in December 1944 and in February 1945.

Part V (Limestones of Western Canada) of the report "Limestones of Canada" was completed. Six weeks were spent on field work to bring the information up to date.

Laboratory investigational work and some field work was done on actinolite, apatite, asbestos, barite, beryl, brucite, calcite, chromite, cryolite, diopside, dolomite, feldspar, fluorite, graphite, gypsum, Iceland spar, limestone, magnesium sulphate, magnesite and hydromagnesite, marl, marble, mica, nepheline syenite, sandstone, talc, tantalite, uranium and other rare-earth minerals, wollastonite, lime, magnesia, basic refractories, basic magnesium carbonate, whiting substitute, Portland cement, rock wool, building stone, and terrazzo and poultry grit.

Technical advice on the production of magnesia from brucitic limestone at Wakefield, Quebec, continued to be given.

A laboratory investigation was undertaken at the request of a Canadian lime company to determine the calcination rates of limestones. Laboratory investigations were undertaken at the request of two other lime companies to assist in improving the quality of the lime.

Raw materials available in the Maritime Provinces for the production of rock wool were investigated, and as an outcome of this work a rock-wool plant is in production in New Brunswick. Investigational work on the production of rock wool in electric furnaces was done at the request of four companies. Work on rock wool was also done for the Research Council of Alberta; the Department of Natural Resources, Saskatchewan; the Department of Lands and Mines, New Brunswick; and for four rock-wool companies in Ontario, Saskatchewan, Alberta, and British Columbia.

Investigation into the activation of brucite magnesia on a large scale was undertaken with the object of affording a domestic source of supply.

An investigation was undertaken to determine the difference in physical properties between dry-ground and wet-ground calcite.

Calcination tests were made on marl from Marlbank, Ontario.

An investigation was made into the causes of discoloration of certain limes.

Attention was given to the possibility of utilizing fluorescent minerals for industrial purposes. Information on Canadian sources, and samples, were supplied to firms interested and to the United States Geological Survey.

A method was devised and apparatus constructed for the determination of abrasiveness of mineral fillers, particularly those used in the paper industry.

At the request of the Department of Transport, weather resistance, toughness, and hardness were determined on four samples of stone under consideration for use in canal lock construction, and another sample of rock was tested for its suitability for road construction.

A sample of ballast gravel was tested for the Canadian National Railways.

Twenty-seven samples of water were subjected to complete analysis and three samples to partial analysis.

A digest of information on new developments in reference to Canadian industrial minerals was prepared for an officer of the United States Bureau of Mines for use in the Annual Review number of Mining and Metallurgy.

The following reports were completed and submitted for printing:

"Limestones of Canada", Part V.

"Peat Moss Deposits in Canada: Report on Investigations, 1939 to 1943."

Owing to the retirement of H. A. Leverin during the year, the investigational work on peat moss was transferred to the Division of Fuels.

Services were rendered by several members of the staff to the following technical and trade organizations: The Canadian Institute of Mining and Metallurgy; the American Institute of Mining and Metallurgical Engineers; the Canadian Ceramic Society; the American Ceramic Society; the Canadian Standards Association; the Canadian Government Purchasing Standards Committee; and the Canadian Brick and Tile Manufacturers Association.

INDUSTRIAL MINERALS MILLING LABORATORIES

The study of chemical reactions of reagents used in flotation, started last year, was continued.

The installation of equipment of a continuous flotation circuit was nearing completion.

The following operations were conducted:

Apatite. Laboratory and mill-run flotation tests on two 5-ton samples of apatite from Frontenac county, Ontario, submitted by Ontario Phosphate Industries, Limited, Toronto.

Asbestos. Separation tests to determine the asbestos content in a sample of serpentine rock from St. Adrien de Ham, Quebec, submitted by Raymond Leblanc, Montreal.

Separation, fiberizing, and grading tests on eighteen samples of drill cores from Thetford township, Quebec, submitted by C. L. Coleman, Toronto.

Brucite. Flotation tests on brucite waste products to recover magnesia.

Calcite. Crushed, screened, pulverized, and air-separated a 3½-ton sample from Robertsville Station, Frontenac county, Ontario, submitted by H. J. Emery, Toronto.

Corundum. Magnetic separation tests, to remove iron-bearing impurities, on fourteen samples of corundum recovered from old mill tailings from Craigmont, Ontario, submitted by Wartime Metals Corporation, Montreal.

Dolomite. Crushed and sized a sample of dolomite submitted by Canadian Dolomite Company, Portage du Fort, Quebec.

Fluorite. Laboratory flotation tests to recover fluorite on two samples from Wilberforce, Ontario, submitted by Cardiff Fluorite Mines, Limited, Toronto.

Laboratory and mill flotation, tabling and jigging tests, to recover fluorite and barite, on three samples from Madoc, Ontario, submitted by Keene Fluorspar Mines.

Flotation tests for the recovery of fluorite on two samples from Lake Ainslie, N.S., submitted by Wm. Papke, Trout River, N.S.

Crushed and ground to 40 mesh a 1-ton sample of fluorite from Madoc, submitted by Alloy Foundry Inc., Merrickville, Ontario.

Laboratory and mill-run flotation tests for the recovery of fluorite, celestite, and sulphides from a 25-ton sample of ore from Birch Island, B.C., submitted submitted by Alloy Foundry, Inc., Merrickville, Ontario.

Garnet. Crushed and screened a sample of garnet rock, submitted by A. G. Chew, Sudbury, Ontario.

Sandblast tests, to determine suitability as sandblast material, on two samples of granular garnet from Labelle, Quebec, submitted by Department of Mines, Quebec.

Limestone. Crushed and screened a sample submitted by Carleton Lime Products Company, Carleton Place, Ontario.

Magnesia. Activated 8 tons of brucite magnesia, involving hydration, calcination, and pulverizing.

Marl. Calcination of two samples of marl submitted by Marlhill Mines, Limited, Marlbank, Ontario.

Mica. Crushed and sized a sample of micaceous rock from Split Mica Mining Syndicate, Sydenham, Ontario.

Separation tests to recover mica and apatite from a sample of suzorite from Suzor township, Abitibi, Quebec, submitted by Paul D'Aragon, Montreal.

Salt. Laboratory flotation tests in connection with the pilot plant project for the purification of salt at Malagash. A series of tests was also conducted to determine the discoloration of molten salt in contact with various alloys.

Standard moulding sand tests on three samples of natural bonded moulding sands, two from the Metallic Minerals Division, and one from Moncton, N.B., submitted by Department of Lands and Mines, Fredericton.

Sandblast tests on three samples of silica sand submitted by Canada China Clay and Silica, Limited, Kasil, Quebec.

Talc. Flotation tests to study froth conditions when using talc as a filler on samples of paper pulps submitted by Canadian International Paper Company, Gatineau, Quebec.

Milkweed Rubber. The joint investigation with the Central Experimental Farm, Department of Agriculture, started last year for the recovery of rubber and resin constituents from swamp milkweed by flotation methods was continued.

CERAMICS LABORATORIES

The high-frequency steatite porcelain plant established at Georgetown, Ontario, under technical guidance of the Division as a wartime measure, manufactured a high-quality product as was proved by tests of dielectric properties in various electrical laboratories in Canada and the United States. The rendering of technical advice was continued.

A major investigation was undertaken on the production of high-quality basic refractories from Canadian brucite, primarily to solve certain problems that arose in the use of this material in the manufacture of basic brick at a Canadian plant, and to settle certain controversial questions.

Co-operation was afforded the Physical Metallurgy Section of the Metallic Minerals Division in connection with special refractory problems, and in the development of investment compounds for precision casting.

The following work was also done in the Ceramics Laboratories:

Six sample lots of refractory products and ten samples of refractory raw materials were tested and reported upon as an aid to industry and to other departments of Government.

Samples of vitrified ceramic "hotel" tableware supplied to the armed forces were tested.

Tests were made and reports were issued on thirty samples of clays and shales.

A large amount of petrographic investigational work was done in connection with research on the development of magnesia refractories from Canadian brucite, and control examinations were made in connection with a number of milling investigations. Determinations were also made, by petrographic methods, of the minerals present and their percentages in samples of moulding sands and investment compounds.

Identifications were made on sixty-two miscellaneous rock and mineral samples.

DIVISION OF FUELS

The Chief of Division and senior technical officers, by means of inspection trips, interviews, and correspondence, were kept informed on technical problems of the coal mining and preparation industry, and of the by-product coke and gas, oil refining, and natural gas industries. They attended committee meetings and conferences with National Research Council and other Government organizations on matters relating to testing and research work on Canadian petroleum oil products and coals. Reports were prepared and distributed to interested parties on: physical and chemical survey of coals from Canadian collieries; burning tests on domestic-type fuels in army camp and other stoves; and the chemical treatment of American and other buckwheat anthracites to render them suitable as blower fuels in respect to clinkering.

The plant facilities and the services of engineers were made available for special co-operative work for the Department of National Defence. The work included the testing of a large number of samples of coals and briquettes, and of gasoline, fuel oils, and lubricating oils submitted by that Department and by the Coal and Oil Controllers. Preliminary plans and specifications were prepared for a semi-technical scale experimental, high-pressure hydrogenation pilot plant, the erection of which is under consideration.

Technical officers served in a consulting capacity on work for the Department of National Defence and for the office of the Coal Controller. Three engineers continued on transfer-loan: one to the Munitions Contracts Branch, Department of Munitions and Supply; one to the Oil Controller; and the third to the Director's Office, to assist in an investigation of the bituminous sand deposits in northern Alberta. During the year 754 samples of this sand from 55 drill holes were tested at the Fuel Research Laboratories. Another engineer conducted field work pertaining to a peat moss investigation.

PURCHASE OF COAL BY SPECIFICATION AND COAL ANALYSIS SURVEY

Samples submitted regularly by the Penitentiaries' Branch, Department of Justice, and by the Department of Pensions and National Health, were analysed in reference to the purchase of coal according to specification. As a service to the

Department of National Defence, the facilities of the laboratories were used in checking the quality of coal deliveries against that guaranteed by contract.

A comprehensive directory showing typical analyses of the different sizes of coal produced at various collieries throughout Canada was completed and a restricted number of copies were distributed.

COMBUSTION ENGINEERING INVESTIGATIONS

The routine weather studies in regard to the degree-day heating load for Ottawa and forty-five additional representative points throughout Canada were continued. Monthly tabulated degree-day data in summarized form were supplied to the office of the Coal Controller throughout the year.

The services of engineers were made available to other Government departments, public institutions, industrial firms, and to individuals seeking advice on fuel, heating, and allied problems. A member of the staff continued to serve as liaison officer and consultant on fuel and heating problems to the Coal Controller, to the Fuel Purchasing Section of the Department of Munitions and Supply, and to the Army, and the Air Force. This work necessitated the preparation of various reports and memoranda of information dealing with many phases of fuel and heating. He also undertook special laboratory investigations of a continuous nature for the Army (Directorates of Chemical Warfare and Smoke, Supply and Accommodation, and Works and Construction); and on three occasions he visited Sherbrooke, Quebec, for the Inspection Board of the United Kingdom and Canada. A meeting of the Stoker Institute of Canada was attended in January in connection with research proposals brought forward by that body. Consideration was also given to a research project proposed by the Boiler and Radiator Institute of Canada in regard to the rating of domestic, low pressure, cast iron boilers.

A special test was made of a new type stove, incorporating a principle of downdraught burning and re-circulation of room air, and a report was issued in March 1945 to the responsible Army authorities. Additional burning tests were made for the Coal Controller to determine the effective use of No. 3 buckwheat anthracite for domestic blower installations in conjunction with a mixture of U.S. No. 1 and No. 2 buckwheat.

The patented process for the promotion of clinkering in blower coals was licensed to several dealers in Quebec and Ontario, and the services of an engineer were required for an extended period to aid in the establishment of the process. In addition, requests for information and aid from consumers and dealers regarding blower coal problems were dealt with. The application of the process to certain non-clinkering western Canadian bituminous coals to be used in domestic stokers was studied and laboratory and field tests were conducted with encouraging results.

Meetings of the Associate Committee of Substitute Fuels for Mobile Internal Combustion Engines (National Research Council) and of its Subcommittee on Producer Gas were attended by a senior engineer. The First General Report of the findings of the subcommittee was issued, and the Second General Report was completed and recommended for publication.

COAL PREPARATION, STORAGE, CARBONIZATION, AND BRIQUETTING

The survey of coals from Canadian collieries with reference to their physical and chemical characteristics and beneficiation was continued. That portion of the survey concerned with the fundamental study of the properties of the coals as mined was extended to include non-coking bituminous and sub-bituminous in the Coalspur, Saunders, Drumheller, and Edmonton areas of Alberta. Studies were also conducted on several new bituminous operations in the Crowsnest areas

of Alberta and British Columbia. The analysis survey of commercial grades of coal as shipped from the collieries was continued, with special reference to Alberta and British Columbia coals. Various interim reports on the surveys for limited distribution were prepared, and a mimeographed bulletin covering the whole New Brunswick field was completed.

On the basis of the most recent studies conducted and information available, a separate report was prepared on a plan for the beneficiation of the New Brunswick coal industry. This report deals with the technical and economic factors of a suggested plan for the washing and subsequent carbonization of the New Brunswick coals with a view to the establishment of a stabilized industry of reasonable duration.

A list of the reports issued follows. Many of them are of a confidential nature and are not available except to authorized persons.

Physical and Chemical Survey Report No. 90 (R.I.C.S. No. 187). Adanac No. 9 Mine, No. 1 Seam, Crowsnest area, West Canadian Collieries, Ltd., Blairmore, Alberta.
Physical and Chemical Survey Report No. 91 (R.I.C.S. No. 188). Elk River Colliery, No. 9 Seam, Crowsnest area, The Crow's Nest Pass Coal Co., Ltd., Fernie, B.C.
Physical and Chemical Survey Report No. 92 (R.I.C.S. No. 191). Elk River Colliery, No. 4 Seam, Crowsnest area; The Crow's Nest Pass Coal Co., Ltd., Fernie, B.C.
Physical and Chemical Survey Report No. 93 (R.I.C.S. No. 192). Coal Creek Colliery, No. 1 East Seam, Crowsnest area; The Crow's Nest Pass Coal Co., Ltd., Fernie, B.C.
Physical and Chemical Survey Report No. 94 (R.I.C.S. No. 196). Banner Colliery, No. 2 Seam, Edmonton area; Banner Coals, Ltd., Edmonton, Alberta.
Physical and Chemical Survey Report No. 95 (R.I.C.S. No. 198). Black Diamond Mine, Clover Bar Seam, Edmonton area; The Great West Coal Co., Ltd., Edmonton, Alberta.
Physical and Chemical Survey Report No. 96 (R.I.C.S. No. 199). New Black Gem Mine No. 4 Seam, Edmonton area; Edmonton Collieries, Ltd., Namao, Alberta.
Physical and Chemical Survey Report No. 97 (R.I.C.S. No. 201). Michel Mine, No. 3 Seam, Crowsnest area; The Crow's Nest Pass Coal Co., Ltd., Michel, B.C.
Physical and Chemical Survey Report No. 98 (R.I.C.S. No. 202). Commander Coal Mine, No. 1 Seam, Drumheller area; Regal Coal Co., Ltd., Drumheller, Alberta.
Physical and Chemical Survey Report No. 99 (R.I.C.S. No. 204). Arcadia No. 2 Mine, No. 2 Seam, Drumheller area; Arcadia Coal Mines, Ltd., Willow Creek, Alberta.
Memorandum Series No. 89: Physical and Chemical Survey of Coals from Canadian Collieries (Number Four), Minto Coal Field, New Brunswick.
R.I.C.S. No. 197: Survey of Commercial Coal Grades in Western Canada.

The storage of coal at military and civil establishments continued to be given special consideration. Large-scale experimental tests on the use of dry capping methods for protecting coal from weathering, degradation, and spontaneous combustion, and from difficulties due to freezing, were completed. The tests indicated that under certain conditions where other methods, such as rolling and compacting, cannot be readily employed the capping method may be quite successful. An important and limiting factor, however, in the application of the method is cost. This work was a co-operative investigation with the Department of Munitions and Supply (Coal Controller) and the Department of National Defence (Army).

Interest in briquetting was increased especially with regard to the beneficiation of the products of degradation produced from low-rank coals and coke. In view of the problems arising, a new modern experimental standard type briquetting press was installed in order that batch experiments and continuous operation tests could be conducted on solid fuels. Some experimental work in the briquetting of fluorspar and chromite ore was also conducted.

The study and separation of petrographic constituents of various Canadian coals was continued, especially in connection with certain western coals, which appear to be amenable to gravity separation. The ultimate aim is to determine which coals are amenable to such treatment, and to what extent the separation will aid in beneficiation of the coal by allowing for the preparation of two or more products, from the same coal, with sufficiently different characteristics to

make them more suitable for certain specific industrial applications such as coking, hydrogenation, and for use in domestic stokers.

On behalf of the Coal Controller, an engineer conducted investigations in the field and laboratory to aid in overcoming some of the difficulties presented by the shortage of American anthracites, especially in the blower sizes. Also at the request of the Coal Controller, an investigation was made at the by-product coke plant of the Algoma Steel Corporation, Sault Ste. Marie, Ontario, of the quality of the domestic coke produced and the operating conditions regulating the product.

Several tests were conducted on the coking and expansion characteristics of coal from the Crowsnest area, B.C. Reports issued on the above subjects, some of which were confidential, included:

R.I.C.S. No. 188: Investigations of Coking Coals from Elk River Colliery of the Crow's Nest Pass Coal Co., Ltd.

R.I.C.S. No. 190: Report on the Clinkering and Burning Characteristics of No. 3 (Barley) Red and White Ash Pennsylvania Anthracites.

R.I.C.S. No. 193: Final Report on Demonstration Tests re the Dri-Kapt Method of Storing Coal.

R.I.C.S. No. 194: Report on the Chemical Treatment of Adanac Stoker Coal to Promote Clinker Formation.

R.I.C.S. No. 203: Separation and Properties of the Petrographic Constituents of Michel No. 3 Seam Coal.

HYDROGENATION INVESTIGATION

Experimental work on hydrogenation of Alberta bitumen that was begun in the previous year was continued. An ultimate analysis was made of the bitumen used as primary raw material for the experiments. This was required for use in draughting a flow-sheet for the complete process of hydrogenating bitumen to gasoline. The liquid phase apparatus was improved by addition of a scrubber for hydrogen sulphide, which made it possible to eliminate lime as a reagent. Equipment was also added for the collection of gases dissolved in the liquid product and released after reduction of pressure. These improvements in technique resulted in a considerable increase in the yield of recoverable oil product. Numerous liquid phase catalysts were tested. Distillation equipment was developed for separation of the product of liquid phase hydrogenation into a recycle fraction and a feed stock for vapour phase hydrogenation. The feed stock so prepared was employed in vapour phase investigations on optimum temperature and catalyst durability.

Hydraulic pressure tests and consulting work on design of high-pressure equipment were done for the Royal Canadian Air Force, the National Research Council, the Royal Canadian Electrical and Mechanical Engineers, the British Admiralty Technical Mission, and the Royal Canadian Navy.

Considerable time was given to planning and design work in reference to the aforementioned experimental hydrogenation plant and laboratories. The primary purpose of these facilities is to obtain information necessary for the design of commercial-scale hydrogenation plants for converting bitumen, heavy crude oil, residuums from refining, and various coals into gasoline. Preliminary plans for the building were prepared by engineers of the Division, and architects of the Department of Public Works made the plans and specifications. A flow-sheet for initial operation of the plant was prepared, and negotiations were carried on with engineering firms who might undertake detailed design of the plant. Design of the small-scale equipment was nearing completion by engineers of the Division. Conferences were held with officials of the United States Bureau of Mines at Pittsburgh and with others.

ROUTINE CHEMICAL LABORATORY WORK

As shown below, 1,786 samples of solid, liquid, and gaseous fuels were analysed, the examination of which involved 12,119 separate chemical and physical determinations, mostly in duplicate, of the different items of analysis. The total included 261 samples of mine air from British Columbia and Alberta; 550 coals and oils from the Department of National Defence; and 109 samples from the Department of Munitions and Supply (Coal and Oil Controllers). During the year, 759 samples of drill core from the bituminous sand deposits in Alberta were also analysed, but are not included in the tabulated data that follow.

	Number of samples	Per cent of total
1. Samples pertaining to investigations of Fuels Division—		
Solid Fuels	492	27·5
Coals	449	
Cokes, peat, briquettes, and miscellaneous	43	
Liquid Fuels Crude oils, gasoline, lubricating oils and hydrogenated oil products.	42	2·4
Gases Natural gas, manufactured gas, and gas from hydrogenation tests.	46	2·6
2. Samples from other divisions of Department of Mines and Resources (coals and oils)	39	2·2
3. Samples from other Government departments—		
Department of National Defence—Army, Air, and Navy	550	30·8
Coals, cokes, briquettes, etc	232	
Gasoline, fuel oils, and lubricating oils	318	
Department of Pensions and National Health— Coals	41	2·3
Department of Justice (Penitentiaries Branch)— Coals	93	5·2
Department of Munitions and Supply	109	6·1
Coals from Coal Controller's Office	24	
Gasoline and miscellaneous from Oil Controller's Office	85	
Other Government departments (including 55 samples of aviation fuels and lubricating oils from National Research Council)	63	3·5
Provincial governments—mostly mine air from Alberta and British Columbia	261	14·6
Commercial firms, private individuals, etc	50	2·8
	1,786	100·0

EXPLOSIVES DIVISION

The inspection of war factories continued to be an important part of the duties of the inspection staff, and the value to factory management of visits made has been acknowledged on many occasions. Unsafe conditions and practices were frequently discovered by the Inspectors. Many visits were also made for special purposes. These included conferences and discussions with

management on major plant changes made necessary by the constantly changing requirements of the Armed Forces for different types of munitions. The task of striking a balance between safety and production to meet urgent war needs had often to be faced. Fortunately, it was made easier by the growing realization of plant officials that consideration for the safety of employees promotes efficiency of operation.

Twenty-eight war and commercial explosives factories were licensed, the same number as in the previous year. A few factories, due to changing war requirements, were temporarily shut down, but were maintained in good working condition in case of need. One large plant manufacturing propellants was closed but was reopened in a few months, and at the end of March 1945 was working almost at capacity. Factories engaged in the manufacture of commercial high explosives and detonators were inspected at frequent intervals, and terms of the licences were generally well observed. The practice now common in most explosives factories of offering prizes for useful suggestions has done much toward making operations involving the manufacture and handling of explosives less hazardous and in increasing plant efficiency. During the fiscal year no accident in the manufacture of commercial explosives resulted in serious injury to personnel. The output of commercial high explosives, detonators, and commercial fireworks in 1944 was lower than in 1943.

Officers of the Division were consulted on many occasions on problems connected with the manufacture, processing, and transportation of explosives. They also served on various committees charged with the duty of directing research for new explosives, their testing, and possible application in the war effort.

STAFF CHANGES

F. E. Leach, who joined the Division as Inspector of Explosives in 1921, and has been Chief Inspector of Explosives since April 1937, retired on superannuation in November 1944. Two new temporary inspectors were appointed, one of whom is Inspector of Explosives in Western Canada and has reopened the office in Vancouver.

LABORATORY

The Explosives Testing and Research Laboratory is maintained jointly by the Explosives Division and the National Research Council under an agreement of June 30, 1942. It is under the direction of M. C. Fletcher, an inspector of the Division.

During the year, 240 samples were received and examined, and comprised the following:

High explosives	103
Initiators	6
Propellants and ammunition	39
Pyrotechnics	82
Toxic gases	2
General	8

Practically all of these examinations were made on behalf of the Department of National Defence, Inspection Board of the United Kingdom and Canada, Allied War Supply Board, and Associate Committee on Explosives of the National Research Council. Samples were also received from Government-owned and private manufacturing plants and from Canadian universities. Samples listed as general were from the Administrative Services, Post Office Department, and from the Board of Railway Commissioners.

Projects Completed by End of Fiscal Year

1. Correlation (between laboratories) of sensitivity, velocity of detonation, and ballistic mortar data.
2. Correlation of ballistic mortar with trauzl lead block test results.

Projects in Progress at End of Fiscal Year

1. Sensitivity of DINA (a new explosive) in crystalline and molten state. Interim progress reports were issued.
2. Effects of low temperature on explosives.

MAGAZINES

The Royal Canadian Mounted Police, whose members are Deputy Inspectors of Explosives, gave valuable assistance in the inspection of magazines and unlicensed premises. Their familiarity with conditions throughout Canada has proved a most useful aid in ensuring that proper precautions are taken in storing and safeguarding explosives. Without their assistance it would be difficult, if not impossible, to have magazines inspected regularly, particularly in isolated sections of the country. The Royal Canadian Mounted Police also rendered valuable service in the administration of P.C. 2903 (July 4, 1940), which regulates the possession, use, and sale of authorized explosives for the duration of the war. The Provincial Police of Ontario, British Columbia, and Quebec, and the chiefs of police in many cities and municipalities co-operated in this work. More than 20,267 Explosives Purchase Permits were issued by these officers, in addition to which Inspectors of the Departments of Mines in the various provinces issued 646 annual explosives purchase permits to mining companies operating under provincial jurisdiction. At the end of the fiscal year, 365 permanent magazine licences and 379 temporary magazine licences were in force.

INSPECTIONS

	Factories	Magazines	Unlicensed premises
Explosives Division Inspectors	160	268	292
Royal Canadian Mounted Police	.....	254	2,864
British Columbia Police	.....	4	.....

IMPORTATION PERMITS

Except for small quantities of liquid nitroglycerine, which are used in oil and gas fields, importations of commercial explosives were confined to nitrocotton for use in the manufacture of lacquers, the amount imported being over 2,000,000 pounds. During the year 387 permits, 15 special permits, and 16 special war permits were issued.

ACCIDENTS

Two accidents occurred in commercial explosives plants, resulting in damage estimated at $3,700, but in no loss of life nor injuries. On December 9, 1944, at the plant of Canadian Industries, Limited, Belœil, Quebec, a fire started in the electric starter house from which sparks blown by the wind to the mill, set off a 600-pound charge of black powder. The fire was attributed to overheated resistors in the starter house. Changes in plant design to prevent a recurrence of such an accident were made.

At the same plant on February 23, 1945, in the early morning, a fire started in the dynamite box packing house, caused by ignition of paraffin wax in the asbestos insulation material around the paraffin wax pipe-line. The asbestos had become impregnated with wax from spillage, which seeped through a collar on the floor above, and was close to the steam pipe. Explosives stored in the building were removed at some risk to safety. The damage amounted to about $700. Changes in plant design and storage regulations were carried out.

A number of minor flashes, and incidents, which resulted in slight injuries to workers, were reported from the various plants.

Reports were received of 107 accidents in the use and handling of explosives, which resulted in 15 deaths and 124 injuries. Most of these accidents occurred in mines, quarries, logging camps, and on construction jobs, but more than a third were caused by children playing with detonators and other explosives. In an increasing number of cases children were able to get possession of military ammunition, often resulting in fatal or serious injuries. The Division has drawn the attention of the appropriate authority to these accidents.

	Accidents	Killed	Injured
Mines and quarries	52	5	59
Elsewhere in industry	12	3	13
Playing with detonators	14	1	16
Playing with other explosives	28	6	35
Miscellaneous	1	0	1
Total	107	15	124

Eight confidential reports with recommendations on accidents in munition plants and storage depots were submitted to the proper authorities.

PROSECUTIONS

Three transportation and shipping companies were charged under the Explosives Act with improper handling and storage of explosives. One company was fined $200 and costs, another $500 and costs, and in the third case the charge was withdrawn when the company corrected the storage conditions.

Seven persons were charged with infractions of P.C. 2903 resulting in four convictions, the charge being withdrawn in the other three cases.

During the year, 231 persons were charged with infractions of regulations in regard to the possession of matches or smoking in explosives plants. Convictions were obtained in 140 cases and fines ranging from $50 to $100, or sentences up to 3 months were imposed; 7 cases were dismissed; and 84 were not completed by the end of the fiscal year.

In 10 cases involving the theft or illegal use of explosives prosecutions were instituted under the Criminal Code of Canada and sentences up to 5 years were imposed.

DESTRUCTION

During the year 5,672 pounds of deteriorated dynamite, 1,204 detonators, and 100 feet of safety fuse were destroyed by officers of the Division or by members of the Royal Canadian Mounted Police.

PUBLICATIONS

Following is a list of reports issued during the year.

MINES AND GEOLOGY BRANCH

English Publication

Separate of Annual Report for the Fiscal Year Ended March 31, 1944.

French Translation

Separate of Annual Report for the Fiscal Year Ended March 31, 1944.

GEOLOGICAL SURVEY

English Publications

Report No.

2471 Memoir 238. *Carboniferous Rocks and Fossil Floras of Northern Nova Scotia*—by W. A. Bell.

Economic Geology Series No. 14. *Petroleum Geology of Canada* (Reprint)—by G. S. Hume.

44-1 *Seismic Surveys and Their Relation to Oil Prospects in Wainwright Area, Alberta*—by G. S. Hume.

44-2 *Geology and Oil Prospects of Lone Mountain Area, B.C.*—by F. H. McLearn and J. F. Henderson.

44-3 *Sussex, N.B.*—by F. J. Alcock and G. S. MacKenzie. (Map only.)

44-4 *Sherritt Gordon Mine Area, Man.*—by J. D. Bateman. (Map only.)

44-5 *Northern Part of Pinchi Lake Mercury Belt, B.C.*—by J. E. Armstrong.

44-6 *Athabaska-Barrhead Map-area, Alberta.*—by M. Feniak.

44-7 *Geology and Coal Deposits of Hasler Creek Area, B.C.*—by J. Spivak.

44-8 *Occurrence of Quartz Crystals, Leeds County, Southeastern Ontario*—by J. M. Harrison and Y. O. Fortier.

44-9 *LaMotte Map-area, Abitibi County, Que.*—by G. W. H. Norman.

44-10 *Londonderry Iron Deposits, Colchester County, N.S.*—by L. J. Weeks.

44-11 *Drinnan to Brûlé Lake, Athabaska Valley, Alberta*—by A. H. Lang.

44-12 *Rare-element Minerals in Pegmatites, Yellowknife-Beaulieu Area, N.W.T.*—by A. W. Jolliffe.

44-13 *Notes on Geology and Mineral Deposits at Ainsworth, B.C.*—by H. M. A. Rice.

44-14 *Whitehorse District, Yukon*—by W. E. Cockfield and A. H. Bell.

44-15 *Some Coal Deposits of the Peace River Foothills, B.C.*—by F. H. McLearn and E. J. W. Irish.

44-16 *Geological Reconnaissance along Fort Nelson, Liard, and Beaver Rivers, Northeastern B.C. and Southeastern Yukon*—by E. D. Kindle.

44-17 *Revision of the Lower Cretaceous of the Western Interior of Canada*—by F. H. McLearn.

44-18 *Alexo Map-area, Alta.*—by G. P. Crombie.

44-19 *Dunlevy-Portage Mountain Map-area, B.C.*—by H. H. Beach and J. Spivak.

44-20 *Nicola, B.C.*—by W. E. Cockfield.

44-21 *Hematite Deposit, Hincks Township, Gatineau County, Que.*—by T. L. Tanton.

44-22 *Mikanagan Lake, Man.*—by J. D. Bateman and J. M. Harrison.

44-23 *Smithers, B.C.*—by J. E. Armstrong. (Map only.)

44-24 *Hazelton, B.C.*—by J. E. Armstrong. (Map only.)

44-25 *Geological Reconnaissance along the Alaska Highway between Watson Lake and Teslin River, Yukon and B.C.*—by C. S. Lord.

44-26 *Tay River Map-area, Alta.*—by J. F. Henderson.

44-27 *Rouyn-Malartic-Destor Region, Que.*—by G. W. H. Norman. (Map only.)

44-28 *Geological Investigations along the Alaska Highway from Fort Nelson, B.C., to Watson Lake, Yukon*—by M. Y. Williams.

44-29 *Duparquet-Larder Lake-Rouyn Region, Ont. and Que.*—by J. W. Ambrose. (Map only.)

44-30 *Geology Adjacent to Alaska Highway between Fort St. John and Fort Nelson, B.C.*—by C. O. Hage.

44-31 *Pouce Coupé-Peace River, Alta. and B.C.*—by C. H. Crickmay (Map only.)

44-32 *Revision of Palæogeography of the Lower Cretaceous of the Western Interior of Canada*—by F. H. McLearn.

44-33 *Dudswell, Wolfe, Richmond, and Compton Counties, Que.*—by H. C. Cooke. (Map only.)

44-34 *Selwyn River, Yukon—by H. S. Bostock.* (Map only.)

44-35 *Shinimikas, N.S.*—by W. A. Bell. (Map only.)

French Translations

44–9 *LaMotte Map-area, Abitibi County, Quebec*—by G. W. H. Norman.
44–27 *Rouyn-Malartic-Destor Region, Quebec*—by G. W. H. Norman. (Map only.)
44–29 *Duparquet-Larder Lake-Rouyn Region, Ontario and Quebec*—by J. W. Ambrose. (Map only.)

Bureau of Mines

English Publications

Folder. *Petroleum Fuels—Deliveries for Consumption in Calendar Year 1943.* List No. 4-1, Coal Mines in Canada.

Explosives Division

English Publication

47 *Report of the Explosives Division for the Calendar Years 1939 to 1943.*

LANDS, PARKS AND FORESTS BRANCH

R. A. GIBSON, DIRECTOR

Greatly increased interest in the Northwest Territories and Yukon has been stimulated by developments such as the Alaska Highway, Canol Pipeline, Northwest Staging Route, the construction of landing fields in the Mackenzie River Valley and in Eastern Arctic, the search for oil in the lower Mackenzie Basin, the radio-active elements of great strategic war value produced at Great Bear Lake, and by recent encouraging reports of drilling operations in the gold-producing area of the Yellowknife district. Basic surveys have been carried on by various Government departments to increase knowledge of these more remote parts of the country, and with the relaxation of the regulations which have restricted the issue of Government publications, it has been possible to print much new, authentic, and useful information about Northern Canada.

In addition to the scientific parties sponsored by the Dominion Government, a number of independent surveys have been carried out by other scientists and professional men who have visited the north country and have released reports of considerable interest. While information received to date concerning current accomplishments in the parallel latitudes of Siberia has been limited, it is quite possible that some of the research which has been carried on by Soviet authorities there may be applied to Canada's northland. Contact has been established, but progress in securing information has been disappointingly slow owing to the preoccupation of many scientists with work relating especially to the war effort. It is hoped that it may be possible for Canadian scientists to visit northern Russia and gain first-hand knowledge of conditions there, just as Soviet scientists are being welcomed at scientific institutions in Canada.

For years the administration of Northern Canada was restricted to the maintenance of existing services, but there is every prospect of additional funds being made available for increased scientific investigation and for more adequate local administration. This is indicated by the parties which have been sent out to assist in assembling information for the North Pacific Planning Project, and by the recent organization of more adequate services for the protection of forest and wildlife resources. Personnel at the Government mining recorder's office at Yellowknife has been strengthened, and steps are under way to organize improved medical and hospital services and to provide for more adequate supervision of education.

The biennial wildlife conferences arranged under the auspices of the Department, at which the various provinces are represented, are resulting in a freer exchange of information and in the adoption of uniform regulations based on scientifically correct principles of wildlife management.

Although wartime restrictions have made pleasure travel difficult, reports from the various National Parks indicate that all available tourist accommodation is filled, and visitors stay for longer periods. During the war, the National Parks and other recreational areas have served as centres of rest and recreation for service personnel, particularly for young men in training for air services. Many of these young airmen, recruited from abroad under the Commonwealth Air Training Plan, will return to their respective homes and do much to advertise Canada's unrivalled tourist attractions as exemplified by the National Parks.

Additional national parks of high standard are required to make the national system more thoroughly representative, to provide more convenient recreation to an increasing number of our people and to sustain tourist interest. It is hoped that suitable areas may be offered by the provinces which are not yet adequately represented in Canada's National Park system.

The products of Canadian forests and forest industries continued to play an important part both in the war effort and the national economy, although a shortage of manpower made it impossible to meet the current demand for sawn lumber, pulp, and paper. Dominion Forest Service officers continued to co-operate with the various war services in solving problems related to the uses of wood, and many new developments in the utilization of forest products have resulted from laboratory research. Fire losses were much higher than usual, due mainly to low precipitation which resulted in periods of high fire hazard, and also because of the shortage of forest protection personnel.

More than half of the total land area within the nine provinces is now occupied with forests, and most of it will yield the highest return if utilized for the production of forest growth. Canada is one of the great timber-producing countries of the world and wood products are manufactured greatly in excess of local requirements. The exported surplus constitutes one of the main items in the nation's favourable balance of trade.

The steady decrease in the wood capital of the Dominion, resulting both from extravagant exploitation and losses through fire, insects, and disease over a period of 70 years, has made it increasingly evident that if the forest industry is to be maintained at even a reasonable level of production, more effective methods of management based on scientific forestry knowledge must be applied to balance depletion and growth. A systematic inventory of the nature, distribution, and amount of timber throughout the country, together with a thorough scientific investigation of all factors relating to the growth, protection, and use of timber is the indicated need and in view of the national importance of this resource and of the complexity of the problems, many of which affect more than one province, leadership should be provided by the Dominion.

Much time and thought have been devoted to planning for development after the war is over. If the sources of revenue are available it would seem desirable that the Dominion, in addition to undertaking and carrying on an adequate research program, should support the provinces in certain standard activities which facilitate the protection and management of the forests.

The ever-increasing importance and extent of the work to be carried on makes it necessary to strengthen the staff of the Branch, but the prospect of obtaining properly qualified personnel is not bright at present because the remuneration of many important positions is still based on the depression period. Scientifically trained and experienced members of the staff, with outstanding qualifications for the work of the Branch, are leaving the Government service to accept employment elsewhere. They cannot be replaced at present rates of remuneration. Young men who were in training for key executive and scientific positions and who enlisted for war service, will not return to their former positions unless the re-classification of positions is assured as better inducements are being offered to them elsewhere.

BUREAU OF NORTHWEST TERRITORIES AND YUKON AFFAIRS

NORTHWEST TERRITORIES

The Northwest Territories comprise that part of the mainland of Canada lying north of the Provinces of Manitoba, Saskatchewan, Alberta, and British Columbia and east of Yukon Territory, the islands in Hudson and James Bays and in Hudson Strait including Ungava Bay, and the vast Arctic Archipelago. The estimated total of land and fresh-water areas of the Northwest Territories is 1,309,682 square miles. According to the 1941 census, the population of the Territories was 12,028, but this figure has since been increased by an influx of workers engaged on joint defence projects, and by increased mining activity.

The Commissioner of the Northwest Territories in Council has power to make ordinances for the government of the Northwest Territories in relation to such subjects as are designated by the Governor in Council. The seat of Government is at Ottawa.

Council

Commissioner	—Charles Camsell.
Deputy Commissioner	—R. A. Gibson.
Members of Council	—A. L. Cumming, K. R. Daly, H. W. McGill, S. T. Wood.
Secretary	—D. L. McKeand.

Work of Council

Six regular and four special sessions of Council were held during the year. Assent was given to the following ordinances: Archaeological Sites Ordinance; Herd and Fencing Ordinance; Petroleum Products Ordinance; and Protection of Children Ordinance. Amendments were also made to the Motor Vehicle Ordinance and the Administration of Justice Ordinance.

In addition, matters of policy were discussed in connection with Joint Defence Projects in Northwest Canada; Eastern Arctic Patrol; Eskimo affairs; economic studies of the Northwest Territories; health and welfare; education; hospital and medical services; Northwest Game Act and regulations; Government reindeer herds; forest fire protection; appointment of Territorial officers and commissioners; public works; transportation services; agricultural and horticultural surveys; radio services.

Dr. H. L. Keenleyside, Assistant Under-Secretary of State for External Affairs, resigned from the Northwest Territories Council as of January 30, 1945.

Administration

The Lands, Parks and Forests Branch is responsible for the administration of the various acts, ordinances, and regulations pertaining to the Northwest Territories. To facilitate departmental administration there is a Superintendent for the Eastern Arctic and one for the Mackenzie District. A departmental agent is stationed at Fort Smith, N.W.T., and this officer is also Superintendent of Wood Buffalo National Park, Agent of Dominion Lands, Crown Timber Agent, Mining Recorder, Stipendiary Magistrate, and Marriage Commissioner. The Sheriff of the Northwest Territories is also stationed at Fort Smith. The Mining Recorder, Agent of Dominion Lands, and Crown Timber Agent for the Yellowknife Mining District, which includes what was formerly known as the Great Bear Lake Mining District, is stationed at Yellowknife. The Mining Recorder for unorganized districts is located at Ottawa, and Sub-Mining Recorders are also located at Ottawa, Edmonton, Fort Simpson, Fort Norman, Aklavik, Coppermine, and Port Radium.

Medical Officers

The Northwest Territories have been divided into seven medical districts and two sub-districts over which medical officers of the Department of Mines and Resources have jurisdiction. These officials have their headquarters at Fort Smith, Fort Resolution, Fort Simpson, Fort Norman, Aklavik, Port Radium, Yellowknife, Chesterfield, and Pangnirtung, and on the vessel carrying the annual Eastern Arctic Patrol. In addition, doctors are employed at various points throughout the Territories to look after the general health of those engaged in joint defence projects and the mining industry.

All doctors have been appointed coroners and medical health officers under the Public Health Ordinance. Some of the doctors make patrols to outlying areas and all make use of the radiotelegraph service in prescribing for those who are unable to obtain treatment at the medical centres. The Superintendent of Medical Services of the Indian Affairs Branch advises the Northwest Territories Administration in medical matters and reports received by radio from the North are answered in such a way that the best measure of relief can be extended through facilities available. The Department of Pensions and National Health in Ottawa serves as a consulting agency in matters of public health.

In this connection, it is desired to pay tribute to the outstanding services rendered the Northwest Territories Administration by the late Dr. Ross Miller, formerly Chief Medical Assistant to the Minister of Pensions and National Health, whose experience, knowledge, and administrative qualities proved invaluable in meeting and solving medical and health problems in Northern Canada.

A qualified medical officer accompanies the annual Eastern Arctic Patrol. In addition to serving as ship's doctor he examines and treats the natives at each port of call and submits a report of his activities together with any recommendations necessary for improvement of the medical services.

Hospitals

Twelve hospitals were operated in the Territories during the year. Of these, nine were operated by missions of the Roman Catholic Church and the Church of England in Canada, two by mining companies at Yellowknife and Port Radium, and one by the Indian Affairs Branch of the Department at Fort Norman. Hospital facilities were also provided by private enterprise at Norman Wells for those engaged on the Canol Project and related activities.

The mission hospitals are situated at Fort Smith, Fort Resolution, Hay River (sick bay), Fort Simpson, Aklavik (2), Rae, Chesterfield, and Pangnirtung. By special arrangement, the Northwest Territories Administration pays the mission hospitals $2.50 per diem for the care of indigent whites, Eskimo, and half-breeds who are admitted on the recommendation of the resident medical officer. In the case of patients suffering from venereal disease, $3 is paid for in-patients, and $1 per diem for out-patients. The aged and infirm are cared for in industrial homes operated in conjunction with the mission hospitals at Aklavik, Chesterfield, and Pangnirtung. These inmates are also admitted on the recommendation of the departmental medical officers, and the missions receive $200 per person per annum for their care and maintenance. During the year, the sum of $28,825.67 was expended for the care of destitute patients in the hospitals, representing approximately 11,530 days of treatment. Thirty-five patients were accommodated in the industrial homes at a total cost of $3,359.43, and twenty-five patients were treated in provincial institutions at a cost of $10,856.96. The above figures do not include the amounts paid by the Indian Affairs Branch for services to Indians only.

During the year a survey of health conditions and medical and hospital services in the Mackenzie District of the Northwest Territories was undertaken by Dr. G. J. Wherrett, Secretary of the Canadian Tuberculosis Association, under the joint auspices of the Northwest Territories Administration and the Canadian Social Science Research Council. Most of the important settlements in the Mackenzie Basin were visited and a number of important recommendations were made, which are receiving consideration by the Northwest Territories Council.

Schools

Residential and day schools are operated by the Church of England and the Roman Catholic missions. The residential schools are located at Fort Resolution, Fort Providence, and Aklavik (2), and the mission day schools are located in the principal settlements. Owing to the nomadic tendencies of the natives some of the day schools in outlying areas are only operated during certain periods of the year when the natives are in the vicinity. During the year 145 children attended the residential schools and 284 pupils attended the day schools.

In addition to the residential and day schools operated by the mission, public schools are operated at Fort Smith and Yellowknife. Grants totalling $27,973 were paid to the various schools and for the maintenance of indigent children in the residential schools. Quantities of school supplies were also furnished. As the Northwest Territories Administration is responsible for the welfare of all Eskimos, arrangements have been made for the maintenance of a number of destitute children in the residential schools at Fort George, Que. School supplies are also furnished to a number of mission day schools operated within the northern portion of the Province of Quebec.

The above figures do not include amounts paid by the Indian Affairs Branch for the maintenance and education of Indian children.

During the year a survey of educational facilities and conditions in the Mackenzie District was carried out by Dr. Andrew Moore, Inspector of Secondary Schools, Province of Manitoba, under the auspices of the Northwest Territories Council and the Canadian Social Science Research Council. Recommendations contained in the report are receiving the attention of the Northwest Territories Council.

Law and Order

Law and order in the Territories are maintained by the Royal Canadian Mounted Police. Detachments have been established at the more important settlements and extensive patrols are made to outlying areas. To facilitate the administration of justice, four Stipendiary Magistrates have been appointed.

Liquor Permits

The operation of the territorial liquor stores at Fort Smith and Yellowknife was continued by the Saskatchewan Liquor Board as Territorial Liquor Agent under the direction of the Northwest Territories Administration. Wartime restrictions on the quantity and quality of alcoholic beverages remained in effect, spirits and wine being on a quota basis and the beer supply limited by the output of the breweries which were subject to restrictions on malt and labour. The sales of spirits and wine at the Fort Smith store were on the whole higher than at Yellowknife, but from October, 1944, the sales at Yellowknife increased considerably over those at Fort Smith.

The net profits from the operation of the liquor stores during the fiscal year amounted to $89,392.79 as compared with $108,273.16 in 1943-44. The profits from the Yellowknife store were $36,404.66 and from the Fort Smith store $52,988.13. The profits from liquor sales and permit fees in the Mackenzie

District, together with $695 derived from fines under the Territorial Liquor Ordinance, were placed in the special liquor account for territorial purposes. The balance in this account as of March 31, 1945, was $339,096.55. The sum of $98 was obtained from the sale of liquor permits issued at Ottawa.

During the fiscal year, 5,215 Class "A" annual permits were issued in the Northwest Territories. The liquor permits issued at Ottawa included 4 Class "B" permits covering sacramental wine and 52 class "C" permits authorizing the importation of limited quantities of spirits, wine, and beer. The sales of liquor at the Territorial liquor stores during the fiscal year were approximately 3,496 gallons of spirits, 2,651 gallons of wine, 2,692 gallons of ale and stout, and 18,774 gallons of beer. The importation permits covered 95 gallons of spirits, 176 gallons of wine, and 15 barrels of beer.

Lands and Timber

Surveyed Lands—Nine settlement lots were sold and patented as follows:—Aklavik, 1; Fort Smith, 1; Hay River, 7. At Port Radium Settlement, 8 surface leases are in force and at Yellowknife 231 such leases have been issued. These leases are at present issued for five-year periods.

Unsurveyed Lands—Small parcels of unsurveyed land suitable for agricultural and fur-farming purposes, as well as tracts with water frontage suitable for transportation and shipping interests, are leased under the provisions of Chapter 113, R.S.C. 1927. The issuing of each lease is authorized by an Order in Council and the number of such leases in force is 41.

Thirty-seven permits to occupy Dominion lands during the pleasure of the Department have been granted. There are 4 grazing leases in force and 6 hay permits were issued under which 109 tons of hay were cut.

During the year 17 assignments affecting lands were registered in the Department.

Timber—A total of 94 timber permits, exclusive of those granted in connection with timber berths, was issued authorizing the cutting of 15,964 linear feet of timber, 40,000 feet board measure of saw timber, 150 roof poles, and 4,367 cords of wood. Of these permits, 28 were issued free of dues to educational, religious, and charitable institutions, to settlers for domestic use and to Government Departments. Ten timber berth permits were granted under which 1,330,668 feet board measure of lumber were manufactured.

The total revenue derived from lands, timber, grazing, and hay was $9,048.63.

Following a preliminary aerial reconnaissance survey of forests in the Upper Mackenzie River drainage area, which during the previous year covered the Slave and Mackenzie Rivers from Fort Smith to Wrigley and along the Liard River between Fort Simpson and Nelson Forks, steps have been taken to establish a Forest Protective Service in the Northwest Territories.

Mining

A renewed interest in the Yellowknife mining district, followed by extensive exploration and staking, overshadowed other mining developments in the Northwest Territories during the year. Encouraging results obtained by diamond-drilling on locations along the west side of Yellowknife Bay led to activity characteristic of a major rush, and as a result the issue of new miner's licences was 900 per cent greater than in the preceding year. The same ratio held in reference to the number of quartz grants issued. Gold production declined sharply with the suspension of milling operations at Negus Mine, remaining producer in the Yellowknife field, but increased production is anticipated with the removal of war-time restrictions.

In addition to the developments in the immediate vicinity of Yellowknife, prospecting and staking were extended into areas within a radius of about 150 miles of the settlement by field parties serviced by aircraft based on Yellowknife. Among the places at which work was carried out were Indin Lake, Sunset Lake, Beaulieu River, Gordon Lake, Johnston Lake, Snare River, Campbell Lake, Courageous Lake, and McKay Lake. Claims also were staked in the Cameron Bank area of Great Bear Lake and in the Coppermine Mountains region to the east.

The acute labour shortage and wartime restrictions continued to have an adverse effect on gold production, and finally forced the mill on the Negus property to close down on October 15, 1944. This mine was the last of several to stop milling operations, but maintenance and development were continued there, as well as at other properties, including the Con and Rycon mines.

The following table shows the value of gold and silver produced in the Yellowknife field since the Con mine first went into production in August, 1938:

Year	Con Mine(1)		Rycon Mine(2)		Negus Mine(3)	
	Gold	Silver	Gold	Silver	Gold	Silver
	$	$	$	$	$	$
1938	239,524	529	.....	.....	.....	.....
1939	1,228,936	3,183	55,209	143	582,046	1,474
1940	1,171,547	2,558	129,543	283	811,395	1,627
1941	1,361,581	3,148	213,521	509	706,436	1,397
1942	1,541,309	4,402	78,212	226	756,010	1,521
1943	783,761	1,756	100,864	225	732,569	1,849
1944	.....	.....	.....	.....	797,834	2,092
Total	6,326,658	15,576	577,349	1,386	4,386,290	9,960

Year	International Tungsten(4)		Thompson-Lundmark(5)		Ptarmigan Mine(6)	
	Gold	Silver	Gold	Silver	Gold	Silver
	$	$	$	$	$	$
1941	217,407	10	316,904	597	34,007	64
1942	120,832	18	869,604	1,690	424,947	920
1943	.....	.....	647,340	1,269	.....	.....
1944	.....	.....	.....	.....	.....	.....
Total	338,239	28	1,833,848	3,556	458,954	984

GRAND TOTAL—Gold, $13,921,338. Silver, $31,490.

(1) Con Mine operated from August, 1938, to September, 1943.
(2) Rycon Mine operated from January, 1939, to September, 1943.
(3) Negus Mine operated from March, 1939, to October, 1944.
(4) International Tungsten Mine (formerly Slave Lake Mine) operated from April, 1941 to September, 1943.
(5) Thompson-Lundmark Mine operated from September, 1941 to September, 1943.
(6) Ptarmigan Mine operated from December, 1941, to September, 1942.

The production of concentrates was continued at the mill of Eldorado Mining and Refining at Labine Point on Great Bear Lake, where more than 200 men were employed. The No. 1 shaft was enlarged to three-compartment size, and

new hoist and headframe installed. Deepening of the shaft to provide new levels at 925, 1,050, 1,175, and 1,300 feet below adit level was also undertaken. Surface exploration in close proximity to the mine was undertaken during the season by geologists of the Department, and, as a result, greater reserves of ore are indicated. Geophysical surveys and general prospecting were also carried on by the company. Figures relating to the tonnage of ore mined, milled, and shipped are not available for publication.

During the year, 1,884 miner's licences, 1,432 renewal licences, and 5,612 quartz grants were issued. Leases have been issued comprising 1,945·25 acres. The total revenue from fees payable under the Quartz Mining Regulations amounted to $97,078.90, including $39,651.65 collected as licence fees.

Coal.—One coal lease comprising an area of 25 acres is in force.

Petroleum and Natural Gas.—Six Petroleum and Natural Gas leases, comprising an area of 3,279·23 acres, are in good standing. New Petroleum and Natural Gas Regulations were established by Order in Council P.C. 5059, dated June 30, 1944. Eight permits were issued under the new regulations, comprising a total of 2,045,275 acres. In addition, two agreements were completed with Imperial Oil, Limited, one concerning what is known as the "Participating Area" and the other dealing with the "Proven Field". These agreements cover areas of 132,642 acres and 7,939 acres, respectively. At the close of the fiscal year 64 wells drilled in the proven field had found oil in commercial quantity. Wells drilled outside the proven field to date have proved "dry". Rentals from oil lands amounted to $1,759.23 for the year. Rentals satisfied from drilling credits totalled $80. Activities conducted under the Canol Project are reviewed in a following section.

Dredging.—Two five-mile stretches of Grizzly and Bennett Creeks are leased for a total rental of $105 per annum.

The Canol Project

Activities associated with the Canol Project at Norman Wells and elsewhere were discontinued on March 8, 1945, when suspension of drilling and production on Canol account was ordered by the United States Government. The pumping of crude oil from Norman Wells to Whitehorse, Yukon Territory, and operation of the refinery at Whitehorse, were also discontinued about March 31. As of March 8, 1945, a total of 67 wells had been drilled under the Canol Project, of which 60 produced oil in commercial quantity. The above were in addition to four producing wells which had been developed by Imperial Oil, Limited, prior to the inauguration of the Canol Project. Sufficient wells were left in operation to meet the needs of Norman Wells refinery, which supplies the petroleum requirement of Mackenzie District, and the remainder were capped. Total production from the Norman oil wells for the fiscal year ended March 31 was 1,280,212 barrels or an average of more than 3,500 barrels per day. The latest estimate of the recoverable reserve of the Norman oil-field is 36,250,000 barrels.

During the year the construction of pumping stations along the pipeline from Norman Wells to Whitehorse was completed, and the first oil reached Whitehorse on April 16, 1944. The refinery at Whitehorse was reported to be complete in January, 1945. A road built to accommodate and stand up under traffic of six-wheeled trucks was completed from Camp Canol on the west bank of the Mackenzie River to Johnston's Crossing, situated on the Alaska Highway, approximately 80 miles east of Whitehorse. This road is about 517 miles in length and in crossing Mackenzie Mountains it attains an elevation of 5,608 feet above sea-level. A telephone line constructed along the right of way also

was completed and placed in operation. At the close of the fiscal year no decision had been reached concerning the ultimate disposal of Canol equipment and buildings.

Northwest Game Act and Regulations

No person except a native-born Indian (or half-breed leading the life of an Indian) or an Eskimo (or half-breed leading the life of an Eskimo) shall engage in hunting or trapping any game protected under the Regulations without first securing a licence to do so.

The following are eligible for hunting and trapping licences:—

(1) Residents of the Northwest Territories, as defined by these Regulations, who on May 3, 1938, held hunting and trapping licences and who continue to reside in the Northwest Territories.

(2) The children of those who have had their domicile in the Northwest Territories for the past four years, provided such children continue to reside in the Northwest Territories.

(3) Such other persons as the Commissioner of the Northwest Territories may decide are equally entitled to licences under these Regulations.

Only British subjects with four years' residence in the Northwest Territories are eligible for licences under Clause 2. A minor under the age of fourteen years shall not be eligible for a licence. A minor assisting his parents or guardians in connection with hunting or trapping operations will not require a licence.

Wood Buffalo Park—The reports of regular patrols by the warden service indicate that the fur catch of 1944-45 was the lowest on record in the history of the park, owing principally to the water conditions in the fur conservation areas where the level in the lakes and sloughs had become very low.

Five bush fires occurred in the park during the summer and were successfully handled by park patrolmen in charge of small fire-crews.

Intensive fire patrolling was carried out during the season by the park wardens. All park permittees were warned of the danger from camp-fires left unattended and that all fires must be properly extinguished before leaving the area.

The park wardens report having seen large groups of buffalo, thus indicating that conditions in the park and also in the areas adjoining are favourable.

Fur and Game—Figures available for the fiscal year under review indicate a drop in the take of most fine furs. This is particularly true of the white fox, beaver, and muskrat, which show a decided drop. Forest fires of a serious nature during the fiscal year 1943-44 are partially responsible for the drop in the number of animals taken. This factor, together with the possibility that the fur cycle for some fur-bearers may be approaching the period of low ebb, may account for the present fluctuation. Responsible officers are continually studying fur conservation measures and attention is being given to the present situation.

Seven fur farms were licensed to operate in the Northwest Territories during the fiscal year.

Comparative figures of the number of big game animals and game birds taken during the licence years ended June 30, 1943, and 1944, and the average for the 5 years ended June 30, 1943, follow:—

	Year ended June 30		5-year Average 1939–43
	1944[2]	1943[1]	
Big Game—			
Caribou	19,387	22,605	21,049
Deer	82	50	55
Moose	679	906	1,152
Sheep	7	20	54
Goat	0	7	12
Game Birds—			
Ducks	8,995	11,380	12,156
Geese	222	1,108	941
Grouse	508	787	763
Partridge	490	1,323	2,111
Prairie chicken	605	1,467	2,034
Ptarmigan	4,548	8,335	8,671

Licences, Permits, and Revenue—Comparative statement of licences and permits issued and revenue derived under the Northwest Game Act.

	Licences Year ended June 30		5-year Average 1940–44
	1945[2]	1944[1]	
Hunting and Trapping—			
Resident	460	504	530
Non-resident bird licences	27	28	20
Trading and Trafficking—			
Resident	106	116	118
Non-resident	3	10	6

	Permits Year ended June 30		5-year Average 1940–44
	1945[2]	1944[1]	
To establish trading posts	7	10	17
To take mammals	1	1	4
To hunt and trap in Wood Buffalo Park	325	322	333
To take Migratory Birds	3	0	10
To take scientific specimens	3	8	7
To take quota (15) beaver	812	1,424	1,496

[1]These figures may differ slightly from those recorded in the Annual Report for 1943–44 because of additional returns received after that report was printed.

[2]Subject to revision as additional returns are received.

Revenue.—Revenue under Northwest Game Act for fiscal years ended March 31, 1944, and 1945, and average for 5 years 1940-44 as shown hereunder:—

	Fiscal Year		5-year Average
	1944-45	1943-44	1940-44
Hunting licences	$ 980 00	$ 1,067 80	$ 1,136 72
Trading licences	1,065 00	2,493 00	2,126 43
Bird licences	111 00	140 00	158 00
Fur farm licences	20 00	12 00	29 60
Trading post permits	12 00	12 00	17 00
Sale of furs	3,192 28	280 90	882 50
Fur export tax	62,751 18	111,472 46	97,848 65
Fines and forfeitures	326 78	648 90	694 43
Sub-total	68,458 24	116,127 06	
Revenue under the Businesses, Callings, Trades and Occupations Ordinance fiscal year ended March 31 1945	6,366 50	5,309 50	
	$74,824 74	$121,436 56	

Infraction of Game Laws.—There were 11 prosecutions for infraction of the game laws. Convictions were secured in all cases.

Reindeer

The Government reindeer herd on the reserve lying immediately east of the Mackenzie Delta was maintained in good condition during the year. The round-up returns showed a total of 6,139 animals in this herd in the summer of 1944. The reductions in the fiscal year were normal and included about 380 deer taken for meat, the slaughter of surplus stock taking place in the autumn and winter. The usual donation of 100 carcasses was made to the mission hospitals and residential schools in the district. The revenue from the sale of reindeer products amounted to $6,000.

The two reindeer herds under native management near the Anderson and Horton Rivers were in fairly good condition during the early part of the year, although there was a shortage of help for herding. It was estimated that these herds contained about 2,650 head in the summer of 1944. However, by September, the situation was suddenly changed by the loss of personnel in the wreck of the native schooner *Cally* during a severe storm off the Arctic Coast near Cape Dalhousie. Those drowned included the Government supervisor of native herds, the proprietors of these two herds, and seven children of the herders. As soon as information concerning the wreck was received, the Administration instituted measures to care for dependent relatives of the herders and to protect the herds. The deer had become scattered to some extent before assistance was available. These matters and problems connected with the settlement of the estates of the deceased herders were receiving attention at the close of the year.

Under prevailing conditions in the Mackenzie Delta area it was difficult to maintain adequate qualified staff for the supervision of the reindeer industry and to carry out the necessary herding and labouring duties. With continued high fur prices only a limited number of the young natives are interested in reindeer herding. However, the essential services were maintained. Some improvements were made in the equipment for the Reindeer Station and material was provided to improve the facilities for handling the reindeer herds and to establish a sub-station at Anderson River.

Eastern Arctic Patrol

The annual Eastern Arctic Patrol was carried out on the R.M.S. *Nascopie* which sailed from Montreal on July 1 and returned to Montreal on October 1, after making 23 calls and covering a distance of 10,648 geographical miles. In view of urgent war requirements, the passenger list again was restricted to administrative officers, members of Dominion Government departments, including Royal Canadian Mounted Police, and radio personnel. Cargo space was reserved for essentials. D. L. McKeand, Superintendent of the Eastern Arctic, made his final trip as Officer in Charge of the Government party. Dr. George Hooper of Ottawa served as medical officer for the outgoing portion of the voyage from Montreal to Churchill, and from Churchill to Montreal the duties were carried out by Dr. Dennis Jordan of Toronto. These officers examined and treated Eskimo at all ports of call, and inspected the hospitals at Chesterfield Inlet and at Pangnirtung.

The officer in charge of the Patrol, accompanied by a medical officer of the Department, Dr. W. L. Falconer, and J. W. Anderson, District Manager of the Hudson's Bay Company, made a special flight from Roberval, Quebec, to the trading centres of Fort McKenzie, Fort Chimo, Payne Bay, and George's River in the Ungava Bay region of northern Quebec, which are not serviced directly by the *Nascopie*. Native Indians and Eskimo at all points of call were examined and treated when necessary. Major McKeand and Mr. Anderson subsequently joined the *Nascopie* at Hebron, Labrador, and Dr. Falconer returned to Ottawa by air.

The Patrol succeeded in reaching and reopening the trading post at Fort Ross in Bellot Strait, which, owing to unfavourable ice and weather conditions, had not been serviced since 1941. The post office at Fort Ross also was reopened.

All Government centres and radio stations, trading posts, missions and United States advance weather and ionospheric stations were serviced, supplies and mail delivered, and personnel relieved as required. No reports of serious crime were received.

The white fox cycle was at the period of lowest ebb, but high prices were received by the Eskimo for fur. Consequently, any relief extended was normal for the period. The health of the native population showed little change. The incidence of tuberculosis, eye diseases, and other ailments peculiar to the Eskimo was noted, and treatment prescribed or carried out as opportunity permitted. An epidemic which occurred on Navy Board Inlet during the autumn of 1943 was investigated and diagnosed as acute entero-colitis.

Investigations instituted in 1943 by the Bureau's geographer were continued on the first leg of the voyage from Montreal to Churchill, and additional information relating to Eskimo camp-sites, climatic conditions, and other geographical factors was obtained. An auxiliary trip by air was also undertaken north from Churchill along the western coast of Hudson Bay.

Yellowknife Administrative District

The Local Trustee Board at Yellowknife, consisting of five members, held 16 board meetings during the year, and passed the usual by-laws covering respectively the assessment of property and the rate of taxation. Many other matters of interest to the community were also discussed.

Aids to Navigation

Aids to navigation were maintained on the Mackenzie River system for the Department of Transport under the direct supervision of the District Agent at Fort Smith. Additional channel buoys installed in 1943 by Marine Operators, a division of the United States Engineering Department, were taken over by

the Department of Transport during the year. During the summer, the Chief of the Aids to Navigation Branch, Department of Transport, visited the Mackenzie District and inspected all points supplied with aids to navigation.

Public Improvements

The two portage motor roads between Fort Fitzgerald, Alberta, and Fort Smith, N.W.T., were maintained throughout the season by Northern Transportation Company, Limited, a crown company, with the aid of equipment rented from the United States Engineering Department. The section of the Grimshaw-Hay River winter road within the Territories was also maintained in condition for traffic by the transportation company using the route, with funds provided by the Northwest Territories Administration. Negotiations were also commenced with the Province of Alberta with the object of rebuilding this road to all-weather standard from railhead at Grimshaw, Alberta, to Great Slave Lake.

In the Yellowknife district, the construction of a road from Yellowknife Settlement to the Con mine was commenced, and a road was constructed by the Department of Transport from the settlement to the temporary landing field at Long Lake with funds provided by the Northwest Territories Administration. Funds were also provided for the survey of an area in the vicinity of Long Lake to be utilized in the construction of a new landing field of standard specifications.

During 1944, all landing fields in the Mackenzie District, including those constructed by the United States Engineering Department along the Mackenzie River, were taken over by the Department of Transport for maintenance.

Scientific Surveys

On the recommendation of an Inter-departmental Committee on Agriculture, composed of members of the Departments of Agriculture and Mines and Resources, surveys were inaugurated in 1944 to determine the agricultural possibilities of the Mackenzie Basin, including the lower Liard River Valley. During July and August, F. V. Hutton, a specialist on horticulture from the Department of Agriculture's Experimental Farm at Morden, Manitoba, visited most of the settlements along the Slave and Mackenzie Rivers and on Great Slave and Great Bear Lakes. This survey included examination of soils, inspection of existing farms and gardens, and determination of potential areas for future development. Advice concerning gardening was also furnished to the inhabitants interested in gardens, and a selected list of co-operators was chosen to introduce new varieties of seed and roots to the region in 1945.

During the summer, Dr. A. Leahey, soil specialist of the Experimental Farms Service, Department of Agriculture, Ottawa, conducted an exploratory soil survey along the principal rivers in the Mackenzie District. This survey was made chiefly between Fort Nelson, B.C., and Fort Simpson, N.W.T., along the Fort Nelson and Liard Rivers. From Fort Simpson, the survey was continued up the Mackenzie River to Great Slave Lake, and thence up the Slave and Athabaska Rivers to McMurray, Alberta. The survey revealed considerable land suitable for agriculture, although contingent on heavy clearing operations.

Surveys of the fisheries of Great Slave Lake, Great Bear Lake, and the Mackenzie River were instituted by the Department of Fisheries during the summer. These surveys disclosed a potential annual yield of more than 3,000,000 pounds of fish, principally whitefish and lake trout, in Great Slave Lake.

A hydrographic survey of the north shore of Great Slave Lake and Yellowknife Bay was undertaken by the Hydrographic Service of the Department.

Geographic and Economic Research

In August, 1943, a geographer was engaged by the Bureau of Northwest Territories and Yukon Affairs, and has since been engaged in the compilation and analysis of information concerning the geography, natural resources, and peoples of the Northwest Territories. Such research work has been supplemented by data gathered in field work. Most of the data obtainable on the Eastern Arctic have been compiled and published either in pamphlet form or as a series of articles in the *Canadian Geographical Journal*. These pamphlets, as well as reprints of the articles, are available on request. Similar studies on northwestern Canada, including the Mackenzie District and Yukon Territory, are now under way.

Publicity and Information

Recent developments in Northern Canada, including defence construction projects, have focused attention on the economic possibilities of the Territories, and requests for general and detailed information continued to be heavy. To meet the demand, pamphlets designed to answer the usual questions asked about the resources and industries of the region, were compiled and multilithed. In addition, reprints of a series of articles describing the geography, resources, and peoples of the Canadian Eastern Arctic were issued in co-operation with the Canadian Geographic Society.

A list of these publications printed for general distribution follows:—

The Northwest Territories—Administration, Resources, Development
The Yukon Territory—Administration, Resources, Development
An Outline of the Canadian Eastern Arctic
Mineral Resources and Mining Activity in the Canadian Eastern Arctic
Eskimo Population in the Canadian Eastern Arctic
A Brief History of Exploration and Research in the Canadian Eastern Arctic
Economic Wildlife of Canada's Eastern Arctic—Caribou
Conquest of the Northwest Passage by R.C.M.P. schooner *St. Roch*

Requests for special information also were dealt with, and writers, editors, publishers, and individuals were supplied with articles, photographs, and maps. Extracts from encyclopedias, almanacs, year books, etc., also were checked and revised as required.

YUKON TERRITORY

Yukon Territory has an area of 207,076 square miles. It is bounded on the south by British Columbia and Alaska; on the west by Alaska (longitude 141 degrees west); on the north by the Arctic Ocean; on the east by the Northwest Territories. Most of the Yukon's present population is found in three areas; the northern or Dawson District, the southern or Whitehorse District, and the Upper Stewart River or Mayo District. According to the 1941 census, the population of Yukon Territory was 4,914, but this figure has since been increased by the influx of workers on joint defence projects and by military personnel.

The Yukon was created a separate territory in June, 1898. Provision is made for a local government composed of a Chief Executive, called the Controller, also an Elective Legislative Council of three members, with a three-year tenure of office. The Controller administers Government measures and works under instructions from the Governor in Council or the Minister of Mines and Resources. The Controller in Council has power to make ordinances

dealing with the imposition of local taxes, sale of liquor, preservation of game, establishment of territorial offices, maintenance of prisons and municipal institutions, issue of licences, incorporation of companies, solemnization of marriages, property and civil rights, administration of justice, and generally all matters of a local and private nature in the Territory. The seat of Government is at Dawson, Y.T.

Territorial Council

The triennial election of the Yukon Territorial Council was held on February 9, 1944, and the following candidates were elected for a three-year term: Dawson District, John R. Fraser, Dawson; Mayo District, Ernest J. Corp, Keno Hill; Whitehorse District, Alexander A. Smith, Whitehorse. The Controller of Yukon Territory is G. A. Jeckell, Dawson.

Work of Council

The Yukon Council met on May 2 and was prorogued on May 12, 1944. The annual supply bill was approved, and ordinances passed respecting the erection and inspection of buildings and fire prevention in taxation areas; the regulation and operation of cinematograph machines and the licensing of operators; sidewalks in taxation areas; the legitimation of children; and the claimant of a bounty on wolves and coyotes. Amendments were also made to the Assessment, Liquor, Vital Statistics, Motor Vehicle, Game, Sale of Beer, Income Tax, Workmen's Compensation, and Venereal Disease Prevention Ordinances.

Administration

The Lands, Parks and Forests Branch of the Department at Ottawa is responsible for the transaction of business arising from the general administration of the Territory under the Yukon Act and Ordinances passed by the Territorial Council; for the disposal of lands under the Dominion Lands Act; for the administration of the Yukon Placer and Quartz Mining Acts; and for the collection of revenue.

For local purposes, the Territorial Government raised $91,515.82. The amount transferred from the Liquor Account to the General Account was $207,500. There was no grant from the Dominion Government to the Territorial Government this fiscal year.

The Alaska Highway

During the year, maintenance of the Alaska Highway, which links Dawson Creek, B.C., with Fairbanks, Alaska, a distance of 1,523 miles, was continued by the Northwest Service Command of the United States Army. The work included grading and ballasting as required, and the replacement or repair of bridges that suffered damage from high water or flash floods. A highlight of the year's operations was the completion of a modern steel and concrete bridge over Teslin River at a point 80 miles east of Whitehorse. Telephone and telegraph lines along the highway also were maintained. During the latter part of the year, maintenance crews were being gradually reduced and surplus equipment withdrawn. A number of temporary work camps along the route of the highway also were dismantled and removed.

The Northwest Service Command also undertook maintenance of flight strips constructed along the right of way for contact flying, together with the access roads serving the flight strips. Access roads to the R.C.A.F. intermediate aerodromes at Aishihik Lake and Snag were maintained by the Department of Transport.

The Haines Military Road, which links the port of Haines, Alaska, with the Alaska Highway and meets the latter about 95 miles west of Whitehorse, was closed to traffic during the year.

The Joint Traffic Control Board, with headquarters at Edmonton, continued to supervise travel on the highway, which is restricted to persons on official business and to bona fide prospectors.

Mining

Mining operations in Yukon Territory were maintained on a greatly reduced scale, as compared with previous years, the curtailment being attributed entirely to the prevailing shortage of labour brought about by war conditions. While practically all gold produced was the result of placer operations, interest in prospecting for lode increased during the year, particularly in the areas adjacent to the Alaska Highway, Canol Road, Haines Cut-off, and access roads.

The production of gold from placer operations, mainly by dredging, amounted to 29,410·34 ounces, the value of which, at $35 per ounce, is $1,029,362. Compared with the previous year, this figure represents a decrease of 23,443·24 ounces, caused by the closing down of a number of gold dredges previously operated.

Entries were granted for 170 placer and 221 quartz mining claims and 2,983 such claims were renewed for another year. As no leases of quartz mining claims were granted or cancelled, the area held under lease remained the same as last year, namely, 5,310·81 acres.

Gold Royalty.—The total amount collected for royalty on gold obtained from placer deposits up to March 31, 1945, was $5,337,102.80, of which amount $11,029 was collected during the fiscal year.

Dredging Leases.—Five leases to dredge for minerals in the beds of rivers in the Territory are in force, and comprise a total river stretch of 34½ miles. The rental received from this source up to March 31, 1945, amounted to $212,047.07, of which $1,144.30 was collected during the fiscal year. These leases comprise portions of the beds of the Klondike and Finlayson Rivers. For the purpose of gold recovery five dredges engaged in mining in Yukon Territory.

Hydraulic Mining Location.—The regulations for the disposal of hydraulic mining locations were withdrawn by Order in Council dated February 2, 1904, but the leases then in force were not affected by such withdrawal. Four hydraulic mining locations are still held under lease, comprising a total stretch of approximately 16 linear miles. Rentals amounting to $218,248.03 have been collected on account of such locations, the amount received during the fiscal year being $2,390.

Coal Leases.—Four coal mining leases, comprising in all an area of 182·5 acres, are in good standing. The revenue for the year from this source amounted to $96.50.

Placer Mining Claims

The total number of placer claims in good standing at the close of the year was 2,725, most of which are held by the Yukon Consolidated Gold Corporation, Limited. Five dredging leases were operated by this company during the season and these produced more than 21,000 ounces of gold. The company employed an average of 123 men, the peak during the operating season being 174, and expended $413,319 for salaries and wages. A further sum of $244,764 was spent for equipment, supplies, freight, etc.

The greater part of the 29,410·34 ounces of gold produced during the year was from the Dawson District. The Mayo District produced 272 ounces and the Whitehorse District 150 ounces.

Lode Mining

Dawson District.—Entries were granted for 77 quartz claims staked during the year, and 144 such claims previously staked were renewed.

Mayo District.—The only lode mining operations in this district during the year were carried on by individual operators. Two hundred and fifty-nine mineral claims were renewed, and 145 others are held under twenty-one-year leases.

Whitehorse District.—Ninety-two new quartz entries were granted and 27 claims previously staked were renewed.

By Order in Council P.C. 4574, dated June 4, 1943, provision was made that the requirements of the Yukon Quartz and Placer Mining Acts, Dredging and Hydraulic Mining Regulations as to representation work be suspended, provided the holders of properties acquired thereunder pay to the Mining Recorder the same fees or rental at the same times as they would be required to pay for renewals if the prescribed work had been performed. By this suspension the owners of mining rights were encouraged to retain possession of their holdings until supplies and labour are procurable.

Prospecting Leases

Prospecting leases representing a total stretch of 325 miles were issued during the year, comprising locations on several water courses, an increase of 177 miles over the previous year. Of this stretch, 263 miles were in the Dawson District, 49 miles in the Whitehorse District, and 13 miles in the Mayo District.

Assay Office

The Assay Office was maintained as usual at Keno by the Territorial Government. A total of 936 samples of rock was received from all parts of the Territory, and 1,451 assays or quantitative analyses were made. In addition, qualitative analyses and chemical tests were made in connection with identification and classification of various rocks and minerals of which no record was kept. The assays made were gold and silver, 936; lead, 494; zinc, 13; and copper, 8.

Lands and Timber

Lands.—There are now in force 10 agricultural leases, 16 permits to occupy Dominion lands, 23 waterfront leases, and 24 homesteads. The revenue from lands was $3,960.50.

Timber.—The number of permits issued was 130, authorizing the cutting of 6,607,284 feet board measure of saw timber and 23,567 cords of wood. Fifteen licence timber berths were in force. There were 4 timber seizures. The total timber revenue amounted to $17,684.86.

Roads and Bridges

Expenditures on the maintenance of the road system out of territorial funds amounted to $56,878.32 and were confined almost entirely to the repair and maintenance of the roads in mining areas.

Development of Aircraft Landing Facilities

The sum of $6,535.69 was expended on improvements to the landing fields at Carcross, Selkirk, Mayo, and Dawson. The field at Carcross was practically reconstructed at a cost of $4,029.27. The fields at Dawson and Mayo were kept in condition throughout the winter for wheel-equipped aircraft.

Agriculture

The season was favourable and fodder and vegetable crops in the Dawson and Mayo areas were good. A few residents of the Territory co-operated with the Dominion Department of Agriculture in vegetable seed trials and good results were obtained from most of the varieties sown.

Fur and Game

Collections made under the Fur Export Tax Ordinance amounted to $7,599.87, an increase of $1,111.26 over the previous year's collections. An increase in the number of beaver, fisher, red, cross, and silver fox, lynx, mink, muskrat, otter, and wolverine pelts was reported. Bear, coyote, black fox, white fox, marten, weasel, and wolf pelts showed a decrease. The number of wolf pelts presented was 219, and coyote pelts 145. Revenue from Game Ordinance licences was $5,339, a decrease of $705 from the previous year.

Public Welfare

The health of the people in the Territory was reported as generally good. Six cases of infantile paralysis were reported in the Dawson District, in only two of which are there likely to be any permanent disability. Thirty-one cases of chicken-pox occurred in the Whitehorse District, but no complications were observed.

Registrations under the Vital Statistics Ordinance during the year were 183 births, 95 marriages, 105 deaths.

The hospitals at Dawson and Whitehorse were operated throughout the year and grants towards their maintenance were provided by Council. The numbers of hospital days for patients during the year were: Dawson, 14,767; Whitehorse, 6,061. A public nurse was employed for about eight months at Mayo, but one was not available for the remainder of the year.

The sum of $35,621.82 was paid on account of relief. St. Paul's Hostel, Dawson, was paid $2,975.20 for the care of indigent half-breed and white children who attended the Dawson school.

Education

Five schools were maintained in the Territory during the year, including two at Dawson and one each at Whitehorse, Carcross, and Mayo. Twelve teachers were employed and the total number of pupils enrolled at the end of the fiscal year was 356. The total amount expended on schools was $59,733.88.

Law and Order

Law and order were maintained throughout the Territory by the Royal Canadian Mounted Police.

LAND REGISTRY

The Land Registry maintains a record of lands under Dominion control; administers certain classes of these lands, including Dominion lands reserved to Canada under the Transfer of Natural Resources Agreements, certain Ordnance and Admiralty lands, Soldier Settlement charged lands and other public lands; issues Letters Patent; adjusts, in conjunction with the western provinces, seed grain, fodder, and relief indebtedness advanced by the Dominion alone, or by the Dominion and provinces jointly; and administers matters in connection with the purchase of lands acquired for the Alaska Highway, and mineral rights reserved by virtue of Section 57 of the Soldier Settlement Act.

Central Office of Record

This comprises an inventory of Dominion-owned lands, shows the situation of each parcel and its area, the purpose for which it was acquired, and the name of the department administering the property. The general public and other departments of the Government have found the Central Record a ready source of information and it is expected that a steadily increasing use of this feature will be made after the end of the war. There are 6,403 parcels listed.

Ordnance and Admiralty Lands

During the year, investigations were made of Ordnance and Admiralty lands in Nova Scotia, Quebec, Ontario, and British Columbia. Two parcels were transferred to other departments, 16 properties were disposed of by sale, and 68 leases were granted. Surveys were made of lands at Sorel, Longueuil, and Levis, Quebec, and Hogs Back, Ontario. The revenue from Ordnance lands amounted to $20,012.06.

Public Lands

Two parcels of public lands were transferred to the administration of this Department and 8 areas were disposed of by sale. Investigations were made of properties in Prince Edward Island, Quebec, Ontario, Saskatchewan, Alberta, and British Columbia. The revenue amounted to $22,203.75.

Soldier Settlement Lands

Unpatented lands against which charges under the Soldier Settlement Act are registered, remain in the right of the Dominion under the administration of the Land Registry.

Letters Patent are issued to entrants who complete the required duties in accordance with the terms of the Dominion Lands Act, if their indebtedness to the Soldier Settlement has been liquidated. If the duties are complete but this indebtedness still unpaid, Letters Patent are issued in the name of the Director, Soldier Settlement of Canada, under the authority of the provisions of Section 27 of the Soldier Settlement Act, and the amendment of 1931.

Timber and Grazing Within the Provinces

Timber.—Within the boundaries of the National Parks there are 11 licence timber berths covering a total of 61·41 square miles. Two of these berths are in the Province of Manitoba and 9 are in British Columbia. During the year licences, in duplicate, were issued for each berth—the revenue amounted to $5,587.45.

On the Dominion Government Coal Block, near Hosmer, B.C., there is one permit timber berth from which a revenue of $962.21 was derived.

Timber cutting operations continued active on Ordnance Reserve No. 1 and Naval Reserve A. on St. Joseph Island in Lake Huron and throughout the year the following material was cut: 2,499 railway ties, 6 cords of pulpwood, 68 fence posts, and 4,320 feet board measure of hemlock logs. The revenue collected was $272.22.

Grazing.—During the year 7,652·9 acres were covered by 6 annual grazing permits on Dominion lands along the southern boundary of Saskatchewan and Alberta and sworn returns by the permittees indicate that for the grazing season 1944, there were 375 cattle, 92 horses, and 400 sheep maintained on the lands. The revenue consisting of ground rental amounted to $265.10.

Seed Grain, Fodder, and Relief Indebtedness

During the year, recommendations relating to the adjustment or apportionment of outstanding seed grain, fodder, and relief indebtedness were submitted in 1,524 cases by the Alberta, Saskatchewan, and Manitoba Adjustment Boards. These recommendations were ratified by Orders in Council and 2,026 discharges and releases of liens were issued. As a result, indebtedness amounting to $148,052.18 was written off. A total of 2,614 inquiries was received from the provinces for statements of outstanding indebtedness relative to the issue of land grants, and 1,689 certificates of indebtedness were issued. In addition, 5,682 inquiries were received from different Debt Adjustment Boards in the western provinces. Gross collections for the fiscal year amounted to $116,195.37, an increase of $45,443.69 over the previous year. The sum of $4,617.52 was refunded, leaving a net revenue of $111,577.85.

As the staff engaged on this work has other responsibilities as well, it is impossible to give a definite figure for the cost of administration, but the total amount including office expenses and field investigations is approximately $6,000.

The following summary shows the financial operations for the year ended March 31, 1945:—

	Principal	Interest	Total
Debits—			
Balance outstanding March 31, 1944	$2,631,963 86	$3,615,177 99	$6,247,141 85
Accrued interest April 1, 1944, to March 31, 1945		151,610 36	151,610 36
Total debits	$2,631,963 86	$3,766,788 35	$6,398,752 21
Credits—			
Net revenue April 1, 1944, to March 31, 1945	$ 70,693 70	$ 40,884 15	$ 111,577 85
Amount written off as loss by Orders in Council (Sec. 1, Chap. 51, 17 George V)	36,003 17	112,049 01	148,052 18
Amount collected and retained by Province of Saskatchewan as Commission, Clause 18, Natural Resources Agreement with Province of Saskatchewan	3 00	14 04	17 04
Total credits	$ 106,699 87	$ 152,947 20	$ 259,647 07
Amount outstanding March 31, 1945	$2,525,263 99	$3,613,841 15	$6,139,105 14

SUMMARY

Province of Manitoba

	Principal	Interest	Total
Debits—			
Amount outstanding March 31, 1944	$ 11,923 28	$ 17,655 67	$ 29,578 95
Accrued interest April 1, 1944, to March 31, 1945		609 86	609 86
Total debits	$ 11,923 28	$ 18,265 53	$ 30,188 81
Credits—			
Net revenue April 1, 1944, to March 31, 1945	$ 628 12	$ 233 93	$ 862 05
Amount written off as loss by Orders in Council	235 92	932 57	1,168 49
Total credits	$ 864 04	$ 1,166 50	$ 2,030 54
Amount outstanding March 31, 1945	$ 11,059 24	$ 17,099 03	$ 28,158 27

Province of Saskatchewan

	Principal	Interest	Total
Debits—			
Amount outstanding March 31, 1944	$1,693,593 83	$2,274,851 10	$3,968,444 93
Accrued interest April 1, 1944, to March 31, 1945		96,748 92	96,748 92
Total debits	$1,693,593 83	$2,371,600 02	$4,065,193 85
Credits—			
Net revenue April 1, 1944, to March 31, 1945	$ 48,357 25	$ 35,792 77	$ 84,150 02
Amount written off as loss by Orders in Council	11,287 86	53,683 79	64,971 65
Amount collected retained as commission	3 00	14 04	17 04
Total credits	$ 59,648 11	$ 89,490 60	$ 149,138 71
Amount outstanding March 31, 1945	$1,633,945 72	$2,282,109 42	$3,916,055 14

Province of Alberta

	Principal	Interest	Total
Debits—			
Amount outstanding March 31, 1944	$ 926,421 75	$1,322,634 97	$2,249,056 72
Accrued interest April 1, 1944, to March 31, 1945		54,250 33	54,250 33
Total debits	$ 926,421 75	$1,376,885 30	$2,303,307 05
Credits—			
Net revenue April 1, 1944, to March 31, 1945	$ 21,708 33	$ 4,857 45	$ 26,565 78
Amount written off as loss by Order in Council	24,479 39	57,432 65	81,912 04
Total credits	$ 46,187 72	$ 62,290 10	$ 108,477 82
Amount outstanding March 31, 1945	$ 880,234 03	$1,314,595 20	$2,194,829 23

Province of British Columbia

	Principal	Interest	Total
Amount outstanding March 31, 1945	$ 25 00	$ 37 50	$ 62 50

Letters Patent

Patents were issued during the fiscal year for 2,793 acres of land in the Provinces of Manitoba, Saskatchewan, Alberta, British Columbia, and in the Northwest Territories and Yukon Territory. Two hundred and thirty-three certified copies of patents were issued for which $675 was paid to the Department.

Alaska Highway Land Acquisition

The acquisition of land for the Alaska Highway and related duties have recently been transferred to this Department and placed under the administration of the Land Registry.

The work includes the completion of the surveys of the highway and the placing of permanent monuments, as well as the survey of adjoining roads, maintenance camp-sites, telephone repeater station sites, and flight strips; the resurvey of the site of former U. S. Army Headquarters at Fort St. John and several parcels near Fort St. John and Dawson Creek, B.C.; draughting of plans; completion of purchase of land included in the right of way of the highway and land comprising flight strip, hospital, reservoir, and camp-sites; completion of filing easements for water pipes to Dawson Creek, B.C., and Fort St. John, B.C., and for widening right of way of telephone lines from Wagner, Alberta, to Grande Prairie, B.C.

Mineral Rights Reserved by Section 57 of the Soldier Settlement Act

Various parcels containing mines and minerals were acquired by the Dominion in the right of Canada as appurtenant to farms which were purchased or otherwise acquired by the Soldier Settlement of Canada for the purposes of the Soldier Settlement Act. These rights were administered by the Soldier Settlement under the Minister of Mines and Resources. Soldier Settlement is now part of the Department of Veterans Affairs and the Department of Justice has given the opinion that the mineral rights remain with this Department and are to be administered under the Dominion Lands Act.

NATIONAL PARKS BUREAU

The outstanding fact about the National Parks in the fiscal year 1944-45 is that, notwithstanding the limitations imposed on travel by war-time conditions and the general public preoccupation with the prosecution of the war, attendance at many of the parks was limited only by the amount of accommodation available. This fact may be attributed mainly to three causes: (1) The use made of the National Parks by members of the Armed Forces as centres for vacation and recuperation; (2) greatly increased patronage of the parks by Canadians in surrounding areas within practical driving distances; (3) a pronounced tendency upon the part of vacationists during war time to spend longer periods in the parks. To this third fact is due mainly the apparent paradox that although attendance, as shown by admittances at the park gates, is down as compared with pre-war years, pressure on accommodation and other resources within the parks is greater than at any previous time.

The first of the three factors mentioned above is a transient one which will pass away with the war period, but the other two factors promise to become permanently effective. They indicate a permanent increase in demand for accommodation which will have to be taken care of as soon as labour and material become available.

The National Parks Bureau has continued its policy, established in the early days of the war, of avoiding all expenditures except those which are necessary to protect the people's property, as represented in the National Parks,

from depreciation. Plans, however, have been made and advanced to the point where they can be quickly put into execution, for the further development and improvement of the parks as soon as the country returns to a peace-time economy.

Maintenance within the above limitations has involved during the year not only ordinary repair work on roads but the construction of a number of bridges, as enumerated in the Roads and Bridges section of this report. Some minor extensions were made to the telephone systems. A number of permits were granted for private construction, but work was limited by the restrictions on material and labour.

Operations of alternative service workers within the National Parks continued to be carried on under the direction of the Bureau, and are summarized in this report. The National Historic Parks and National Historic Sites were administered and maintained. Improvements were made in the detection and forecasting of fires, and fire losses in the parks were the lowest in several years. Some success was achieved in restricting the damage done by the mountain pine bark-beetle in Banff and Kootenay National Parks.

Administration in Canada of the Migratory Birds Convention Act was continued by the Bureau, and publicity and public relations work, appropriate to the times and conditions, was carried on.

Administration

The National Parks are administered by the National Parks Bureau, with headquarters at Ottawa. In addition to the administrative staffs at Ottawa, resident Superintendents and staffs are located in the principal parks. A number of townsites in the parks, some with year-round populations, are administered as such; outside of the townsites or sub-divisions the huge area of the National Parks, amounting to more than 29,000 square miles, is maintained as a natural museum in which the conditions of the original wilderness are disturbed as little as possible. Throughout this whole area wildlife is strictly protected.

Administration of the parks is under the authority and provisions of the National Parks Act, sundry provincial agreements, and the National Parks Regulations. The Act defines the general purposes of the National Parks as follows:

> "The Parks are hereby dedicated to the people of Canada for their benefit, education, and enjoyment, subject to the provisions of this Act and Regulations, and such Parks shall be maintained and made use of so as to leave them unimpaired for the enjoyment of future generations."

EVENTS OF INTEREST

Notwithstanding the limitations on travel which are inseparable from war conditions the National Parks appear to be becoming increasingly popular as centres of recreational activity. Not only are they chosen by individuals as places of rest and relaxation; they are becoming more and more popular as gathering-places for those interested in sports and even cultural activities, as evidenced by the Banff School of Fine Arts. This is a tendency which may be expected to continue and increase with the return of peace. In the future, undoubtedly, greater attention will be paid to the development of healthy minds in healthy bodies, and nowhere can this be accomplished with a more appropriate environment than in the National Parks.

Some of the principal gatherings in the parks during the fiscal year 1944-45 are briefly noted hereunder:

The 21st annual gathering of the Trail Riders of the Canadian Rockies consisted of a five-day ride beginning at Banff on the morning of July 28 with Eohippus Lake as the objective. The party consisted of approximately 80 riders from many parts of Canada and the United States, accompanied by Indian guides, equipment, etc. The occasion marked not only the "coming-of-age" party of the Trail Riders, but also retirement from the office of Secretary-Treasurer of Dr. John Murray Gibbon, founder of the organization in 1924 and Secretary-Treasurer since its inception. Dr. Gibbon was succeeded in office by Mr. H. Travers Coleman, of Winnipeg.

Voted as one of the most successful hikes in their 12-year history, the Sky Line Trail Hikers of the Canadian Rockies held their 1944 hikers' camp at Sunshine Lodge, Banff National Park, August 4 to 7, 1944. Approximately 70 hikers took part in the outing, which included daily excursions from Sunshine Lodge to some of the most spectacular scenery in the vicinity of Simpson Plateau close to the border between Alberta and British Columbia, and reached to altitudes of 7,000 feet.

The Banff Summer School of Fine Arts was held as usual during the month of August, with a record attendance of 340 students at the following courses: Art, Music, Theatre, French, and Weaving; several courses were offered in some of these subjects. After the war there will be further courses offered in pottery and modelling, and possibly photographic art. It is also proposed to make Banff the permanent home of the school if suitable arrangements can be made, and to extend the course to two months. This year's school included two conferences: the Alberta Writers' Conference and the Western Canada Theatre Conference.

The Alpine Club of Canada held its annual camp in one of the most beautiful valleys in the Rockies—Paradise Valley, from July 16 to 29. Very fine weather was enjoyed by the climbers. Of the 80 visitors, 15 were from the United States and 6 from England; others came from all parts of Canada.

The recreational activities of the park were made more available to women of the Armed Forces when the Y.W.C.A. War Services Committee opened a Women's Leave Centre for 70 girls. The official opening took place on June 30, with the Park Superintendent officiating.

The Annual Bonspiel was the largest in the history of the Club, with 44 rinks competing, 30 of these being visiting rinks from various districts in Alberta. The Bonspiel was held during the week starting February 12.

A skating carnival, sponsored by the Jasper Community Skating Rink, held in Jasper National Park on February 16 and 17, consisted of a fancy dress competition, figure skating, and hockey game. There were about 50 participants in the fancy dress competition, many of them outstanding in their representation of comic and foreign dress. Figure skating was the outstanding attraction of the carnival. The local figure skating club was assisted by members of the Glenora Skating Club of Edmonton, which included a nationally-known figure skating family, and the Edson Figure Skating Club of Edson, Alberta.

The Jasper Volunteer Fire Brigade contributed their part to the community entertainment by sponsoring two sports days and a Christmas Tree Party. At the sports days on May 24 and Labour Day all types of children's sports were conducted, and with the true community spirit of the Fire Brigade no child of

the three or four hundred attending, win or lose, went home without a prize. At the Christmas Tree party on December 20, a program of songs and dances was provided and as in previous events 300 children all received a gift.

Skiing is playing a very important part in the winter recreational activities of Jasper Park. Greatly increased interest was demonstrated during the 1944 season and the local skiing club was very active. After assistance was provided by the Parks Bureau in opening up a road to Lone Pine, on Whistler Mountain, the club erected a club-house at this point. At this level all types of terrain are available—easy slopes for beginners and more difficult ones for the practised or professional skiers. The Whistler Mountain ski run was used extensively by local parties during the winter and the Tonquin Valley, Watch Tower, and Snow Bowl areas were well patronized by visiting parties.

Three very successful bonspiels were held in Jasper during the winter.

Improvements were made to the existing buildings in the camp of the Lethbridge Y.M.C.A. in Waterton Lakes National Park, and three new cabins were built. Three camps for boys were held, each attended by about 80 boys. In addition one camp for girls was held.

The Lethbridge Presbytery, United Church of Canada, replaced a tent camp at Waterton Lakes with a large permanent structure. Three camps were held, each accommodating about 80 children. It was proposed to build additional cabins during 1945.

Several Boy Scouts' and Girl Guides' Camps were held in Waterton Lakes Park, and a camp of ten tents was established for the accommodation of R.C.A.F. personnel visiting the park. The annual golf tournament was held under the sponsorship of Cardston Golf Club with 87 entries.

The annual ski camp of the Alpine Club of Canada was held in Little Yoho Valley, Yoho National Park.

The annual Lobstick Golf Tournament was held in Prince Albert National Park on August 5 and 6. Entries totalled 219 men and 55 women, and included visitors from Manitoba, Saskatchewan, Alberta, and British Columbia. Profits amounting to $900 were divided equally between the Canadian Red Cross Society and the H.M.C.S. *Waskesiu* Comfort Fund.

A musical entertainment by 100 men from the Army Basic Training Centre at Prince Albert was given on July 22.

Retreat of the Anglican Clergy, and conventions of the Manitoba Dental Association, Lions Club, and Northwest Manitoba Druggists were among the gatherings at Riding Mountain National Park. The United Church Camp Wasaga was conducted during all of July and the greater part of August. The museum building was made available for religious services and there were usually four services each Sunday.

The golf course in Riding Mountain National Park continued to be a popular attraction; tickets sold numbered 5,706 compared with 4,204 in the previous year. The Wasagaming golf tournament drew 124 entries in one of the events, and net proceeds amounting to $250 were turned over to the Red Cross Society.

Interesting features in Banff and Riding Mountain National Parks are the "Wishing Wells" pools in which visitors drop a coin and make a wish. The coins are afterwards retrieved and turned over to the Red Cross Society. During the year the Banff Wishing Well produced $630.14, and the yield from Riding Mountain was $252.65.

Travel to the Parks

Visitors to the National Parks and National Historic Parks during the year numbered 457,392, an increase of 42,041 over the previous year. Details of attendance are given in the following table:

	1944-45	1943-44
National Parks		
Banff	119,065	112,085
Cape Breton Highlands	11,940	17,612
Elk Island	14,881	13,400
Georgian Bay Islands	4,290	3,043
Glacier	345	374
Jasper	12,497	11,905
Kootenay	17,113	14,721
Mount Revelstoke	3,745	3,222
Nemiskam	17	24
Point Pelee	38,745	36,477
Prince Albert	13,059	10,131
Prince Edward Island	33,365	24,963
Riding Mountain	88,096	75,128
St. Lawrence Islands	10,547	8,344
Waterton Lakes	37,278	38,780
Yoho	6,663	5,612
National Historic Parks		
Fort Anne	7,369	7,640
Fort Beausejour	3,344	2,854
Fort Chambly	14,674	9,779
Fortress of Louisbourg	2,617	2,383
Fort Malden	12,978	12,308
Fort Wellington	2,568	2,403
Port Royal	2,196	2,163
	457,392	415,351

DIRECT REVENUE

The gross revenue from the National Parks and from the administration of the Migratory Birds Convention Act for the fiscal year 1944-45 amounted to $288,537.31 and $228.84 respectively, a total of $288,766.15. Compared with the figures for the previous year, which were $335,614.41 and $299 respectively, a decrease of $47,147.26 is indicated.

MAINTENANCE AND IMPROVEMENTS

Highways, roads, trails, bridges, buildings, and recreational facilities were maintained as economically as possible. Provision of municipal services in park townsites was continued on a repayment basis.

Roads and Bridges

There was practically no new road construction during the past year, work being principally confined to maintenance and repairs, such as the removal of slides and washouts, providing ditches and retaining cribs, as well as grading and surfacing.

Some new bridges were constructed in the various parks and a large number of culverts were built or repaired. In Jasper Park a small log bridge was replaced at Mile 15·25 on the Medicine Lake road and new bridges were built over the Maligne River at Maligne Lake, and at the second crossing on this same river. In Banff Park the bridge at the mouth of Goat Creek was rebuilt and in Kootenay Park a new steel-concrete bridge was built over Sinclair Creek

at Mile 3·1 on the main highway. In Mount Revelstoke Park a bridge at Mile 7 was rebuilt. A new truss was placed on the trail bridge over Ice River in Yoho Park. In Glacier Park a 22-foot bridge with approaches was built over a stream 4 miles from Glacier, a 63-foot cantilever bridge with concrete piers was constructed over the Illecillewaet River, and a 36-foot timber bridge was erected over Bear Creek. In Prince Albert Park a bridge was constructed over the Sturgeon River near the park boundary and three bridges were replaced on Moose Creek; however, no new work was reported from Riding Mountain Park or any of the eastern parks except in Cape Breton Highlands Park where considerable repair and rebuilding work was carried out in addition to the construction of several retaining cribs.

Trails

In Banff Park 5 miles of horse trail were improved and 15 miles of the Spray River road out of Banff were rebuilt and culverts replaced. In Jasper Park 2 miles of fire trail were constructed on Signal Mountain. In Kootenay Park 3½ miles of trail were built along the east side of Tokum Creek and another 4 miles from Vermilion Crossing to Hawk Ridge. In Yoho Park a new trail was constructed to the lookout at Paget Peak, a distance of 2½ miles, and in Waterton Lakes Park a trail was built along the west shore of Cameron Lake, 1 mile in length.

Communication Systems

The only new telephone line in Banff Park was a 3-mile offset line from the West Line to Sunset Lookout. In Jasper Park 2½ miles of line were erected along Medicine Lake road, and 2 miles were relocated along Snake Indian River. The temporary line between Jasper and the Army camp at Jasper Park Lodge was dismantled and salvaged, as well as that between the Maligne Lake line and Shovel Pass. In Kootenay 4½ miles of new poles were placed along the main highway south of Kootenay Crossing, and in Yoho Park 7 miles of new telephone line were built from Ottertail Cabin to Mount King. In Waterton Lakes Park 3⅓ miles of the Yarrow Creek line were rebuilt with new wire and poles. In Point Pelee Park a dual telephone-electric line was built across park property but in the remaining National Parks work was confined to repairs and maintenance.

Portable and stationary trans-receiver radio sets are operated in Banff, Jasper, Prince Albert, Riding Mountain, and Cape Breton Highlands Parks and have proved very satisfactory in their field.

The following table indicates the existing mileage of roads, trails, and telephone lines within the National Parks as at March 31, 1945:

National Parks	Roads				Trails	Telephone Lines
	Motor	Secondary	Fire	Total		
Banff	182·4	10·5	94·5	287·4	734·8	273·0
Cape Breton Highlands	50·8	1·6	.....	52·4	21·0	.....
Elk Island	16·0	.....	.....	16·0	14·0	16·0
Glacier	.....	.....	20·5	20·5	91·0	1·5
Jasper	144·0	18·5	34·7	197·2	590·1	414·2
Kootenay	61·1	.....	9·5	70·6	155·2	60·0
Mount Revelstoke	18·0	.....	.....	18·0	33·5	10·7
Point Pelee	6·5	2·8	.....	9·3	.....	.....
Prince Albert	68·0	43·0	163·0	274·0	236·5	134·0
Prince Edward Island	7·1	2·5	.....	9·6	.....	.....
Riding Mountain	51·6	52·9	.....	104·5	113·0	149·0
Waterton Lakes	47·8	13·5	12·0	73·3	159·4	60·2
Yoho	46·0	6·5	25·0	77·5	191·0	69·5
Total	699·3	151·8	359·2	1,210·3	2,339·5	1,188·1

Buildings

New construction by private enterprise was chiefly confined to repairs and improvements although a considerable number of buildings were erected during the year.

In Banff townsite 72 building permits were issued, mostly for repairs or alterations to existing buildings, as only one single dwelling and one duplex were erected. Outside the townsite 5 building permits were issued for a staff-quarters building and linen house, two cabins, an office building, and a laundry. At Jasper 23 building permits were issued but no new construction took place. At Waterton Lakes one new cottage was built and at Waskesiu 12 new cabins were built by the Hillcrest Cabins Limited and an addition was made to one private cottage.

In Point Pelee Park a building permit was issued for the erection of a commercial fish house on park property which has since been completed.

Departmental buildings erected in Banff Park included a lookout cabin at Sunset Lookout; a hayshed at Saskatchewan River Warden Station, and bunk-houses partially completed at the Saskatchewan River and Castle Mountain Warden Stations. A warden's cabin at Bryant Creek was 75 per cent completed. In Jasper an animal shelter was erected in the Upper Corral, and in Kootenay Park a new bath-house was built at Hawk Creek and a hayshed at Mile 21. In Mount Revelstoke Park a new implement shed was erected at Mile 1. A loading platform was built at the Stable and Equipment building in Glacier Park, and a lookout cabin at Paget Peak in Yoho Park. An addition was made to the office building in Elk Island Park. In Prince Edward Island and Cape Breton Parks work was confined to general maintenance such as painting and repairs. In the latter park the Provincial Government has laid the foundation for a 28-foot by 29-foot extension to the dining hall of Keltic Lodge.

Townsites

In Banff 1½ miles of sidewalk were built up to grade and the sewer on Moose Street extended 170 feet; in Jasper preparations were made for extending the water supply intake at Cabin Lake, and in Waterton Lakes 1,800 feet of new 4-inch water main was laid on Cameron Falls Drive in addition to 289 feet of 2½-inch, and 784 feet of 2-inch G.I. pipe which was used to replace small pipe in the headquarters supply line.

Lake Minnewanka Power Development

Under authority of the War Measures Act permission was granted to the Calgary Power Company in 1941 to create a water storage reservoir at Lake Minnewanka in Banff National Park for the generation of hydro-electric power; and in return for this privilege, the Company was obligated to restore or replace any park facilities or natural features rendered useless or suffering damage by reason of the operations and scope of the power development scheme. The extent and character of this rehabilitation work was stipulated and provided for in the interim licence issued to the Calgary Power Company by the Department of Mines and Resources. It was necessary to hold the rehabilitation work in abeyance until the actual construction work was in its final stages and consequently nothing was done until the year 1943-44 when the Company carried out some of the most necessary work, but in 1944-45 only a limited amount was undertaken on account of the acute labour shortage. This consisted principally of cutting and clearing on the north and south shores of Lake Minnewanka: some landscaping near the old and new power-house sites, as well as guard

railing, which was placed east and west of the dam along the Anthracite, Bunkhead, and Calgary roads, together with an extension of the power pole-line to the parking area; and the completion of the new camp-ground water supply.

It is hoped to have this work expedited considerably when the labour situation improves.

Financial Statement

The Lake Minnewanka power development project was commenced in 1941 and by the autumn of 1942 was far enough advanced to allow the power plant to be operated by the Calgary Power Company in conjunction with the Banff distribution system which, together with the Cascade power plant, was taken over from the National Parks Bureau early in 1942. In return for the transfer of ownership of the Cascade power plant to the Calgary Power Company, the latter undertook to compensate the National Parks Bureau in the sum of $198,894.92 inclusive of interest, while the amount received from the Company for the transfer of the Banff distribution system and substation was $48,954.65 including interest. In addition to the above payments the Calgary Power Company had made annual and guarantee deposits during construction, totalling $14,000 of which $3,605.77 has already been refunded to them.

In addition to the above the Lake Minnewanka power plant has been operated by the Company since the autumn of 1942 and during that time they have paid $23,535.36 in water power rental on the basis of installed horse-power.

Use of Alternative Service Workers

Under authority of the National Selective Service Mobilization Regulations, Mennonites and other conscientious objectors exempted from military service were required to carry out alternative service for the duration of the war. Administration of these regulations was carried out by the Department of Labour through alternative service officers who supplied workers as they became available.

Camps which were established in 1941 in Banff, Kootenay, and Riding Mountain Parks continued to operate throughout the year. The camps in Jasper Park, after being closed since November, 1943, were reopened in July and were still in operation at the end of the fiscal year. In addition a temporary camp was opened in Glacier Park, and operated from June to September.

During the period April 1, 1944, to March 31, 1945, a total of 595 men of the 19- to 40-year old class of July 1, 1940, were stationed in these camps. Of these, 16 were discharged for medical reasons, 6 joined the armed forces, 6 went A.W.L. and 248 were transferred to agriculture and industry.

Projects carried out included production of 305,912 linear feet of mine props, 455,000 feet board measure of saw-timber, 268,260 feet board measure of saw-logs, 2,732 cords of fuelwood, and 92 poles. In addition new construction included one steel bridge and seven wooden bridges, 14 culverts, one cabin, 7½ miles of trail, and 1¾ miles of fireguard. Many improvements were also carried out on existing trails, telephone lines, buildings, bridges, and culverts as well as numerous other small projects in connection with the maintenance and repair of Government property.

As in former years alternative service workers were trained in the detection and suppression of forest fires and formed the nucleus of fire-fighting crews.

The number of men employed in these camps was about the same as last year. Due to the transfer of many of the best workers to agriculture and industry, and their replacement with men of inferior quality, the return of work per man-day was somewhat less, and the costs proportionately higher. However, in spite of these difficulties the return of work on the whole was satisfactory.

NATIONAL HISTORIC PARKS AND SITES

The National Parks Bureau is entrusted with the restoration, preservation, and administration of National Historic Parks and Sites and the commemoration of the public services of outstanding characters in Canadian history.

The Bureau is advised in this phase of its work by the Historic Sites and Monuments Board of Canada, an honorary body composed of recognized historians representing the various parts of the Dominion. The personnel of the Board is as follows: Chairman, Dr. J. Clarence Webster, Shediac, New Brunswick; Professor Fred Landon, London, Ontario; Professor D. C. Harvey, Halifax, Nova Scotia; the Hon. E. Fabre-Surveyer, Montreal, Quebec; J. A. Gregory, M.P., North Battleford, Saskatchewan; the Rev. Antoine d'Eschambault, St. Boniface, Manitoba; Major G. Lanctot, Dominion Archivist, Ottawa, Ontario; Professor M. H. Long, Edmonton, Alberta; Professor Walter N. Sage, Vancouver, British Columbia; W. D. Cromarty, National Parks Bureau, Ottawa, Ontario.

A general meeting of the Board was held in Ottawa, May 24-26, 1944, when many subjects relating to the historic background of the Dominion were reviewed and an additional number of sites selected to be marked by the Bureau at a later date. Of the many sites already considered by the Board, 332 have now been marked or acquired and 172 recommended for attention at a later date.

National Historic Parks

Fort Anne National Historic Park is situated in Annapolis Royal, Nova Scotia. The museum building, restored in 1935, was originally the Officers' Quarters and was built in 1797-98 under the supervision of Edward, Duke of Kent, the father of Queen Victoria, when he was Commander-in-Chief of the British Forces in North America with headquarters at Halifax, Nova Scotia.

New wheels were made for some of the old artillery guns which are mounted on the fort grounds; the woodwork in the Acadia Room was painted and several of the other rooms re-decorated; broken tiles in the museum floor were replaced; park benches were repaired, and the roads and paths maintained. Additional articles of historical interest were obtained for the museum.

A total of 7,369 persons signed the museum register during the year.

Port Royal National Historic Park is situated at Lower Granville, Nova Scotia. A replica of the group of buildings which sheltered the first European settlers in Canada has been erected on the exact site where the Port Royal Habitation stood nearly three and a half centuries ago. The original Habitation was the headquarters for about two years of Samuel de Champlain, famous explorer and chief geographer to Henry IV of France, who chose the location and drew up the plan of settlement.

The cannon were painted; preserving liquid was applied to the roofs of the Habitation buildings and the doors painted; the woodwork in the various rooms was polished; built-in bunks were constructed in Lescarbot's Quarters and additional furnishings obtained. An interesting old French anvil, reported to have been found when digging a grave at Grand Pre in 1820, was acquired for display in the blacksmith shop.

Visitors registered in the park during the year numbered 2,196.

Fortress of Louisbourg National Historic Park is situated about three miles from the town of Louisburg, Cape Breton Island, Nova Scotia. Here were enacted the early stages of the long struggle which culminated in the possession of Canada for the British Crown. Erected more than two centuries ago by the French, who had named the settlement in honour of Louis XIV, King of France, Louisburg was captured by the British forces in 1745, but was subsequently handed back to the French. The fortress was again besieged by the English and

finally captured by them in 1758. It is interesting to recall that one of the brigades of infantry engaged in the recapture of Louisbourg was commanded by General Wolfe, who was later to die heroically at Quebec.

All inside and outside woodwork of the museum and caretaker's residence was painted and the doors varnished; the iron gratings over the basement windows of the museum were scraped and painted; the bridge over the moat leading to the ruins of the citadel was repaired; all field signs were painted and re-lettered and a number of new ones made. A total of 2,617 persons signed the visitors' register.

Fort Beausejour National Historic Park is situated near Sackville, New Brunswick. Built by the French, the fort was intended to be an Acadian stronghold against the undefined claims of the English to Acadia. Around the fort the Acadians had their homes and farms. It was captured by the British, under Monckton, in 1755, when the fort was strengthened and its defences extended by a system of entrenchments, traces of which still remain.

The caretaker's residence was painted and a new drain installed. General improvements were carried out at the park and additional articles of historical interest obtained for the museum. Visitors registered at the museum during the year numbered 3,344.

Fort Chambly National Historic Park is situated about twenty miles southeast of Montreal, on a conspicuous headland on the Richelieu River. The first fort, built by the French in 1665 as a protection against the Iroquois, was of wooden construction. After many vicissitudes, it was rebuilt of stone, this work being completed in 1711. In 1760 the fort was surrendered to the British, who, with a small armed force, held it until 1775. In that year the Americans captured the fort; they evacuated in the following year, but burned everything that was combustible, leaving only the four walls standing. The fort was later repaired and garrisoned by Sir Guy Carleton and played an important part in the War of 1812.

All doors and windows of the museum and caretaker's residence were painted; the stone walls of the fort were repointed where necessary; the trees were trimmed and arrangements made with the Chambly Power Corporation to install lights at the entrance to the fort. During the year 14,674 persons signed the museum register.

Fort Lennox National Historic Park is located on Ile-aux-Noix in the Richelieu River, about thirteen miles south of St. Johns, Quebec. The present fort, which stands on the site of one previously erected by the French, was built by the imperial authorities in the period from 1812 to 1827. The island, comprising an area of 150 acres, was acquired by the National Parks Bureau in 1921, and extensive works have since been carried out on the buildings and grounds.

The fort property which had been used since 1940 as a refugee camp was transferred back to the Department and suitable arrangements made with regard to the disposal of the temporary buildings, materials, equipment, etc., which had been built or installed on the island during the period it was occupied by the refugees.

Fort Wellington National Historic Park is situated at the east end of the town of Prescott, Ontario, and adjacent to Highway No. 2. The fort, named after the Duke of Wellington, was erected when the British authorities decided to fortify Prescott as one of the most vulnerable points of attack in the War of 1812, and as the main base for the defence of communications between Kingston and Montreal. It remains as it was when finally completed in 1838, an impressive landmark.

The log palisades around the fort were repaired; the exterior of the caretaker's residence and old guard-house and the interior of the blockhouse were painted; steps were constructed leading to the top of the ramparts; improvements were made to the parking area; the masonry of the entrance gateway was repointed; the guard-house and public conveniences were reshingled and whitewashed inside; the septic tank system was excavated and repaired; small signs marking points of interest on the grounds were painted and additional articles of historical value were obtained for the museum which is located in the blockhouse. A total of 2,568 persons signed the museum register during the year.

Fort Malden National Historic Park is situated in Amherstburg, Ontario. The fort was built in 1797-99 by the Second Battalion Royal Canadian Volunteers. It was strengthened in 1812 as the principal military station on the western frontier and dismantled and abandoned in September, 1813. Only slight evidences of the original fortifications remain.

Arrangements were made with the Department of Public Works to carry out certain repairs to the protective wall which was erected a few years ago on the side of the park property facing the Detroit River; a new picket fence was erected over the northwest bastion; new storm windows were made and painted and many additional articles of historical interest were obtained for the museum. A total of 12,978 persons signed the museum register during the year.

Fort Prince of Wales National Historic Park is situated at the mouth of Churchill River, Churchill, Manitoba, and comprises an area of approximately fifty acres. The fort was built from plans drawn by English military engineers, to secure control of Hudson Bay for the Hudson's Bay Company and England. Construction was commenced in 1733 and completed in 1771. It was surrendered to, and partially destroyed by, a French naval force under La Perouse in 1782. Its ruins, which are among the most interesting military remains on this continent, have been partly restored and over forty cannon have been unearthed. Those suitable have been mounted on the walls of the fort. General supervision was continued throughout the year.

National Historic Sites

During the year all the sites that have been marked on the advice of the Board were suitably maintained. These include Indian earthworks, forts, and villages; French forts, trading posts, and mission enterprises; sites connected with British exploration and naval and military operations in the long struggle for the possession of Canada; posts of the Hudson's Bay Company, and sites related to the social, economic, and industrial development of the country.

CONSERVATION SERVICES

Forest Protection

The favourable conditions which started in 1941 continued throughout the season, and although the total number of fires was slightly greater than in 1943, the total area burned was considerably less. During the ten-month period from January to October a total of 29 fires occurred and burned over an area of approximately 3,263 acres inside the National Parks. This represents the smallest loss in the last eight years, with the exception of 1938 when only 716 acres were burned. Ninety-eight per cent of the area burned was in Riding Mountain and Prince Albert Parks where high hazard conditions prevailed for short periods during the spring and autumn.

Loss of timber was small amounting to only $1,724.25, out of which $1,472 was young growth. An analysis of the causes shows that smokers were responsible for 27·6 per cent of the total, campers for 20·7 per cent, other known causes for 13·8 per cent, settlers for 10·4 per cent, and the remainder either unknown or the result of railways, lightning or industrial operations. Classified according to size, 34·5 per cent were less than ¼ acre, 31 per cent were ½ to 10 acres, 24·1 per cent were 10 to 500 acres, and 10·4 per cent over 500 acres.

Fire Losses in National Parks

Park	Number of Fires		Area Burned Acres		Cost of Suppression	
	1943	1944	1943	1944	1943	1944
Banff	0	5	0	3½	$ 0 00	$ 20 38
Cape Breton Highlands	1	.....	10	.....	1 00	.....
Elk Island	0	.....	0	.....	9 00	.....
Glacier	1	.....	15	.....	7 20	.....
Georgian Bay	0	.....	0	.....	0 00	.....
Jasper	5	2	½	5	10 92	36 12
Kootenay	1	.....	spot	.....	6 75	.....
Mount Revelstoke	0	.....	0	.....	0 00	.....
Point Pelee	1	7	400	102	0 00	18 58
Prince Albert	9	8	5,053¼	1,215¼	1,168 69	1,278 68
Prince Edward Island	0	.....	0	.....	0 00	.....
Riding Mountain	3	5	14	1,937	264 65	264 54
St. Lawrence Islands	0	2	0	¼	0 00	0 00
Waterton Lakes	2	.....	spot	.....	50 00	.....
Yoho	0	.....	0	.....	0 00	.....
Totals	23	29	5,492¾	3,263¼	1,509 21	1,618 30

Improvement in Fire-Prevention Equipment

New fire lookout cabins completed during the year included the Sunset on Mount Coleman in Banff Park, and the O'Hara on Paget Peak in Yoho Park. This makes a total of eleven primary lookouts which have now been completed in the mountain parks.

Following the practice adopted early in the war, purchases of new fire-fighting equipment were limited to replacements and repair parts for existing equipment.

Fire Weather Forecasting

During the past year weather conditions in the West have been very favourable, with precipitation well distributed throughout the season. Periods of extreme hazard occurred during the spring and autumn, but these were of short duration, and were followed by longer periods of low or normal hazard. In the East conditions were much drier with frequent periods of high hazard.

Fire-weather recording stations were in operation in Banff, Jasper, Yoho, Waterton Lakes, Prince Albert, and Riding Mountain Parks from April to October. No new stations were opened during the year.

Insect Control

Measures for the control of the mountain pine bark-beetle (Dendroctonus monticolae) were continued in Banff and Kootenay Parks. Operations in Banff Park have resulted in a definite decline in the beetle population, with the result that operations during the past winter were confined to reworking one area (Brewster Creek) where reinfestation was evident.

In Kootenay Park the salvage of beetle-killed pine, and destruction of green infested trees was continued. Operations were conducted on both sides

of the Banff-Windermere Highway near Miles 16 and 21. One sawmill and planer was operated by the Department and produced 455,000 feet board measure of lumber. In addition 61,824 linear feet of mine props were produced.

Officers of the Bureau co-operated with the Division of Entomology, Department of Agriculture, in carrying out the annual "Forest Insect Survey".

Salvage of Fire-Killed Timber

The fuelwood and mine-prop camp which was opened last year in the Cuthead Creek area of Banff Park continued to operate throughout the autumn and winter. Alternative service workers were again used and, during the six months that the camp was in operation, produced approximately 254,976 linear feet of mine props, and 1,032 cords of fuelwood.

Disposal of Timber Under Annual Cutting Budget

Settlers in the vicinity of Riding Mountain continued to cut saw-timber and fuelwood in the park under the annual budget plan. During the year permits were issued for 2,123,750 feet board measure of saw-timber, 13,149 cords of fuelwood, 50,609 posts, and 7,601 poles. In addition 268,260 feet board measure of sawlogs and 771 cords of fuelwood were salvaged from windfalls, and 11,951 cords of fuelwood were cut by the prisoner of war camp near Lake Audy.

Wildlife Management

Exceptionally mild weather brought the wildlife of the National Parks through the winter of 1944-45 in good condition. Special scientific investigations by Dr. Ian McTaggart Cowan, Professor of Zoology, University of British Columbia, were continued in Banff, Jasper, and Yoho National Parks, with special reference to game animals and range conditions. It was found that as yet there is no evidence of overgrazing in Yoho National Park, but conditions there must be carefully watched and immediate steps taken if such a condition should appear. In Jasper and Banff National Parks, however, no appreciable decrease in the number of elk had occurred, despite the removal of a hundred or more animals by the wardens; the meat from these slaughtered animals was put into cold storage for Indian Agencies and the hides were shipped to Indian Reserves. As soon as sufficient manpower and equipment are available, many more of these animals must be slaughtered, as the range is entirely inadequate for the number of elk present. Fortunately the calf crop in 1944 was small.

Normal wildlife conditions prevailed in the other National Parks.

Mr. Harold S. Peters, Atlantic Flyway Biologist, U.S. Department of the Interior, visited Cape Breton Highlands National Park during the year and added more species of birds to the existing list for the park.

Wild Animal Parks

It was considered advisable to slaughter nineteen buffalo in Riding Mountain Park and the meat and hides were sold by tender. Three buffalo were slaughtered at Prince Albert National Park. The meat was given to the Indian Affairs Branch for the use of Indians and the hides were sold by tender. In order to protect the range from over-use, 200 elk in Banff Park, 250 in Jasper Park, and 40 in Kootenay Park were slaughtered. Twenty-eight elk in the Riding Mountain Park Paddock were slaughtered. Some of the meat from these animals was used in the alternative service work camps. The meat not

required for this purpose and the hides of all slaughtered elk were given to the Indian Affairs Branch. A census of wild animals in fenced enclosures in National Parks as of March 31, 1945, is as follows:

ANIMALS IN FENCED AREAS

Species	Banff Park Paddock	Elk Island Park	Prince Albert Park Paddock	Riding Mountain Park Paddock	Total
Buffalo	15	1,075	7	60	1,157
Elk	1	724	.....	147	872
Moose	.....	186	.....	.....	186
Mule Deer	.....	34	.....	1	35
White-tailed Deer	.....	.....	.....	12	12
Rocky Mountain Goat	1	.....	.....	.....	1
Total	17	2,019	7	220	2,263

FISHING AND FISH CULTURE

Despite the difficulties imposed by conditions resulting from the continuance of the war, there were some advances in fisheries operations in the National Parks of Canada. The institution of a three-day fishing licence, for which the charge is $1, met with favourable comments from interested anglers. The use of the Creel Census Cards in the mountain parks and in Prince Albert Park was continued and 1,332 cards showing 2,253 fishing efforts were returned. While the number stated constitutes an increase in the number of cards returned, a great many anglers still fail to complete Creel Census Cards. The completion of such cards by anglers calls for very little effort on their part and is very important in supplying essential information to guide the management of the fish resources in which they are interested.

Lake fishing in Banff Park was very good, both in Lake Minnewanka and in the smaller lakes. Fishing in the streams, except the Bow River, was found to be increasingly good in proportion to the distance from town or the highways. The Banff Park Hatchery distributed fry in the waters of Kootenay, Yoho, Glacier and Mount Revelstoke Parks.

In Cape Breton Highlands Park, some very good catches of trout were made in the Clyburn, Warren, North Aspy, Grand Anse, MacKenzie, Corney, and Cheticamp Rivers. Because the water was low during the fishing season, the salmon catch in the Cheticamp River was not so good as in previous years.

Fishing in the streams of Glacier Park was very poor, although some good catches of Dolly Varden trout below Bear Creek Falls were reported.

Opinions expressed by anglers indicate that fishing in Jasper Park was good during the season. Some lakes did not provide quite as good angling as in 1943, but others showed improvement. Weather conditions appeared to affect fishing generally, and the lake levels were higher than normal and remained high for a longer period than usual. The number of eggs received at the Jasper Hatchery was greater than formerly. Collections of eggs were made from seven lakes and from a hatchery pond. During the year, 9,000 speckled trout fingerlings and 122,408 speckled trout eggs were shipped to Banff Park Hatchery and approximately 732,275 trout eggs were collected in Jasper Park.

The fishing in Kootenay Park was above the average, with some very fine catches reported taken from the Kootenay River. Dolly Varden Creek was closed to fishing.

Angling in Mount Revelstoke Park was good during the past season, particularly in Millar Lake, where many good catches were made.

In Prince Albert Park, fishing generally was fair, with moderate catches of lake trout, pike, and pickerel reported. Relatively few catches of smallmouthed bass were made. Commercial fish for whitefish was permitted to a limited extent, in Waskesiu Lake during the summer and in Crean and Kingsmere Lakes during the winter.

Sport fishing in Prince Edward Island Park is very limited. A number of trout were taken from Long Lake and the lake of Shining Waters.

During the month of September another shipment of approximately 300 mature lake trout was transported to Clear Lake, Riding Mountain Park, from Clearwater Lake, north of The Pas. Fishing in the park lakes showed an improvement over previous years.

In Waterton Lakes Park, angling was again one of the major attractions, though fishing conditions were not as good as in some previous years. The Waterton Lakes Hatchery continued to distribute fry and fingerlings in park waters. Approximately 40,000 No. 2 rainbow fingerlings were carried through the winter in two rearing tanks.

Fishing in Yoho Park waters was only fair and the number of anglers was smaller than in normal years.

The following statement shows the number of fry, fingerlings, yearlings, and adult fish distributed in park waters during the year:

Park	Rainbow Trout					Cutthroat		Speckled Trout			Lake Trout	Total
	Fry	Fingerlings				Fingerlings		Fingerlings				
		No. 1	No. 2	No. 4	Yearlings	Fry	No. 1	No. 1	No. 3	Yearlings		
Banff	283,000	30,000	.....	.....	.....	82,400	.....	9,000	.....	.....	.....	404,400
Jasper	.....	57,045	118,539	4,178	8,455	.....	.....	.....	38,200	4,714	.....	231,131
Kootenay	20,000	.....	.....	.....	.....	40,000	.....	.....	.....	.....	.....	60,000
Glacier	.....	.....	.....	.....	.....	10,000	.....	.....	.....	.....	.....	10,000
Mt. Revelstoke	.....	.....	.....	.....	.....	10,000	.....	.....	.....	.....	.....	10,000
Yoho	15,000	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	15,000
Waterton Lakes	.....	.....	47,500	.....	.....	.....	52,600	.....	.....	.....	.....	100,100
Riding Mountain	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	*300	300
Total	318,000	87,045	166,039	4,178	8,455	142,400	52,600	9,000	38,200	4,714	300	939,931

*(Adults)

MIGRATORY BIRDS CONVENTION ACT

The Migratory Birds Treaty, which was signed in Washington, D.C., on August 16, 1916, and made effective by Act of Parliament of Canada, 1917 (Chapter 130, Revised Statutes of Canada, 1927, and Amendments), was designed for the better protection of certain birds that migrate between Canada and the United States. In this conservation measure the Dominion and the provinces co-operate. Regulations in accordance with the Statute are agreed upon and are made effective by both the Dominion and the provinces.

The responsibility for the police work in connection with the enforcement of the provisions of the Migratory Birds Convention Act and Regulations thereunder throughout Canada was transferred to the Royal Canadian Mounted Police in 1932.

In 1944 conditions relating to waterfowl improved in British Columbia and in the Prairie Provinces, except that in southwestern Saskatchewan and southern Alberta precipitation was below normal. The mallard is the most numerous species of duck in the West and this species showed a marked increase in most

areas in British Columbia and remarkable concentrations in southern Alberta. In the East the population of sporting ducks was satisfactory, but an unusually mild, dry autumn in Ontario and Quebec resulted in poor hunting and bags. Greater snow geese showed a large increase in Quebec. In the Maritime Provinces, Canada geese increased slowly but the autumn migration of brant was disappointing.

Only minor changes in seasons and bag limits were made in the Migratory Bird Regulations for the hunting of waterfowl and other migratory game birds. Close co-operation was continued with provincial governments, game conservation societies, and other organizations interested in bird conservation.

In the entire Dominion there are 752 honorary game officers, of whom 14 are officers of the Forest Service, 102 are officers of the Department of Fisheries, and 105 are Canadian Pacific Railway Police. The game and fishery officers of the Provinces of New Brunswick, Quebec, Ontario, Manitoba, and British Columbia and the members of the New Brunswick Provincial Police are ex-officio game officers under the Migratory Birds Convention Act.

Field administration of the Act was continued under the supervision of four District Migratory Bird Officers. The Chief Federal Migratory Bird Officer for British Columbia carried out a detailed scientific examination of wildlife resources throughout a large area in central British Columbia. The Chief Federal Migratory Bird Officer for the Prairie Provinces made extensive field investigations in the Grande Prairie and Peace River Districts of Alberta in collaboration with the North Pacific Planning Project and also made joint inspections of certain bird sanctuaries and projects under the Prairie Farm Rehabilitation Act in Saskatchewan. The Chief Federal Migratory Bird Officer for Ontario and Quebec conducted field investigations in the Gaspé Peninsula and in southwestern Ontario. The Chief Federal Migratory Bird Officer for the Maritime Provinces continued his intensive study of the numerical status and the migration of woodcock. Officers of the Bureau disseminated, by lectures and radio, information about migratory birds and their conservation, and lecture material, including motion pictures and lantern slides, was lent to voluntary assistants.

The marking of wild birds with official bird bands, each bearing a return address and an identifying number, in order to obtain certain useful data concerning the migration and general biology of wild birds in their natural habitat, was continued effectively during the period covered by this report.

It is indispensable that certain types of precise information be available for guidance if adequate steps are to be taken for the conservation of wild bird life as a valuable natural resource, and the only satisfactory way of obtaining many of the important data required is by means of organized scientific bird banding. The usefulness and possibilities of this practical method of precise bird study have been expounded and demonstrated repeatedly in many of the recent important wildlife conservation discussions.

In North America, the bird-banding work is being conducted in full co-operation between Canada's National Parks Bureau and the Fish and Wildlife Service of the United States Department of the Interior, Washington, D.C. The National Parks Bureau has administered bird-banding investigations in Canada since 1923.

Wild migratory birds may be banded only under authority of official permits, which are issued only to persons who possess sufficient ornithological ability. These conservation-minded citizens carry on banding work without remuneration from the Department, supply their own equipment, pay any other incidental expenses, and furnish the National Parks Bureau, for official use, with full detailed reports of all birds banded by them. The number of voluntary collaborators has at times exceeded 200.

As of December 31, 1944, the Official Canadian Bird-Banding Records contained 457,532 records of birds that had been banded, together with a total of 32,571 detailed records of the recovery of birds that carried bands. Much of the new and useful scientific information which has been made available through banding studies involving the use of such records is published in current ornithological and conservation literature.

Persons who take or find banded birds are urged to help advance scientific knowledge of wild birds as a natural resource of great economic importance by reporting the details to the Controller, National Parks Bureau, Ottawa.

Sixty-four bird sanctuaries, comprising an area of approximately 1,291 square miles, are now reserved under the Migratory Birds Convention Act in Canada. Two new sanctuaries, Machias Seal Island in New Brunswick, and Nechako River, British Columbia, were established during the period under review.

During the year 1,008 permits and licences were issued. Printed material distributed comprised 5,686 copies of the Migratory Birds Convention Act and Regulations, 13,850 Abstracts of the Regulations, 42,987 posters, and 6,831 educational pamphlets.

The Tenth Provincial-Dominion Wildlife Conference was held in Ottawa, February 22-24, 1945. This conference of leading provincial and Dominion officials cencerned with wildlife conservation was very helpful in promoting knowledge of wildlife problems. As a result of such conferences at intervals of two or three years, important advances in the development of a national wildlife policy for Canada have been made.

The conference of 1945 was the first gathering of this kind in which an official representative of the Government of Newfoundland participated.

The resolutions adopted related to the following items: an expression of regret at the death of Reverend Brother Marie-Victorin, D.Sc., and of Jack Miner, O.B.E.; additional investigations of the effects of bird predation on fish in various parts of Canada; encouragement of the formation of junior Fish and Game Clubs; the publication of pamphlets on wildlife conservation; the establishment of a standard method of marking pelts on which bounty has been paid; regulation of the use of aircraft for sporting purposes; giving effect to a more beneficent attitude toward natural science in the conservation of wildlife resources; government control of a new insecticide, pending adequate investigation of its effects; the training of adequate wildlife personnel; relaxation of existing restrictions on the importation of hunting dogs into Canada from the United States; a longer period for the shooting of American and red-breasted mergansers by salaried fishery officers and other authorized persons; stabilization of fur royalties; and prevention of the illicit shipment of fur through the mails.

The Bureau was represented at the Ninth North American Wildlife Conference in Chicago, April 24-26. Two papers on waterfowl and wildlife conservation were presented to this largely attended conference by the Bureau's representative and were well received.

PUBLIC RELATIONS

The tendency of Canadians to make more use of their National Parks, which has been marked during the years of the war, continued during the year under review. An increase in attendance of 42,041 over the previous year shows that, notwithstanding the continued strain of the war (or perhaps because of it) and with travel from outside of Canada reduced to a minimum, the parks are playing an increasing role in the recreational life of Canadians. The possibilities of this development, and the long-range view of what may be accomplished after the return of peace, make necessary continued activity of the Information and Publicity Division, particularly in the field of public relations. The theme has been a persistent effort to make Canadians better aware of the property they possess in their National Parks, to create pride in the beauty of their wonderful heritage, and to indicate how the parks can be used to maintain national health

and morale. The contribution which the parks can make to national prosperity as the chief attraction upon which must be built the Canadian tourist industry is not overlooked, but is not being stressed during the war period.

The two principal channels through which the public is approached in the above connections are (*a*) addresses to conventions and other gatherings, and (*b*) articles in newspapers and magazines. In the first of these two channels the Superintendent of the Division attended and addressed a tourist convention called by the Government of Ontario at Toronto; the annual meeting of the Ontario Parks' Association at Windsor, Ontario; a special meeting of businessmen and the Board of Trade at Leamington, Ontario; a special meeting at Windsor, Ontario, called by the Minister of National War Services to consider tourist business, and the Canadian Association of Tourist and Publicity Bureaus at Vancouver. Addresses on or related to National Parks were also delivered to the Rotary Club of Montreal, the Optimist Club of Winnipeg, the Griffons Club of Winnipeg, Saskatchewan Tourist Bureau at Regina, Board of Trade of Cardston, Alberta; Calgary Board of Trade; joint meeting under auspices of local clubs at Banff; joint meeting of Gyro Club, Chamber of Commerce, and Victoria and Islands Publicity Bureau at Victoria; Civic Bureau Board of Trade at Vancouver; Vancouver Parks Commission; Chamber of Commerce at Jasper, Alberta; Kiwanis Club and Alberta Motor Association directors at Edmonton; Prince Albert Board of Trade; Board of Trade Executive, Saskatoon; Brandon Rotary Club, and others.

The press publicity consists of articles dealing with or related to National Parks. Some of these are prepared upon request of the editors or publishers concerned; others are sent out as general press releases, care being taken to send them only to editors likely to be interested. It is appropriate that the excellent co-operation given in this respect by the Press of Canada should be acknowledged. During the year 42 general press articles were released, and 559 clippings were received showing that they had been published in representative newspapers throughout Canada. To illustrate these articles 219 cuts and 254 newspaper matrices were supplied. Special articles on the National Parks of Canada were also written on request for the publishers of two encyclopedias in the United States and for the *Canada Year Book*.

The National Parks Bureau maintains an excellent library of motion picture films featuring the scenic attractions of the parks and the birds and animals to be found therein. Some 85 subjects have been prepared in film form, and about 1,500 copies of these subjects are in circulation. Prior to the war this circulation included many countries; now it is confined mainly to Canada, the United States, the British Isles, Australia, New Zealand, South Africa, and a number of the South American Republics. Because of the war no new films were made in the year under review, but 13 black-and-white and ten Kodachrome prints of existing subjects were made to replace wornout copies. Films are lent without charge to responsible borrowers, mainly churches, schools, clubs, travel and sport organizations. During the year 1,393 prints went out to borrowers, and 1,302 were returned. Films inspected, repaired, and rewound in the Bureau's film laboratory totalled 1,458. Exhibitions of National Parks films were made on 11,170 occasions, and attendance reported amounted to 769,882. As many borrowers, however, neglect to report attendance, it is a reasonable assumption that the films were seen by more than one million people. By bringing to this large audience visual knowledge of the National Parks much is being done to ensure increased attendance in the post-war years.

Within the field of visual publicity also falls the Division's activities in circulating still pictures and lantern slides. During the year 1,096 photographic prints were bought and 1,324 were distributed, mainly for publication in newspapers, magazines, periodicals, and books. Notwithstanding the vogue of motion pictures it may be noted that a demand continues for coloured stereopticon slides, of which 1,475 were distributed on loan.

Under war-time conditions, and having regard to the scarcity of paper and printers' labour, as well as the policy of discouraging unnecessary travel, distribution of parks' literature has been kept to a rigorous minimum. Booklets and folders are sent only in response to requests. This policy has enabled the Bureau to get through another year without printing any new booklets except small re-runs of "Playgrounds of the Prairies" and "Playgrounds of Eastern Canada" to supplement existing stocks. Distribution of parks' literature during the year is shown in the following table:—

Banff folder	6,620
Canada's Mountain Playgrounds	6,450
Cape Breton Highlands folder	130
Elk Island folder	320
Fort Anne Guide	6,000
Jasper Park folder	3,070
Kootenay-Yoho folder	670
Playgrounds of Eastern Canada	5,750
Playgrounds of the Prairies	6,075
Prince Albert Park folder	4,570
Prince Edward Island folder	2,020
Riding Mountain folder	170
Waterton Lakes folder	1,395
Riding Mountain booklet	100
Riding Mountain Kodachrome folder	1,475
National Parks folder	6,150

DOMINION FOREST SERVICE

During 1944 the products of Canadian forests and forest industries continued to play an important role in the Allied war effort. Indications are that the cut of sawlogs and pulpwood will show some improvement over that of 1943. Due to acute shortage of woods labour, however, it was not possible to meet in full the demands for sawn lumber, pulp, and paper. War requirements continued to receive first priority in the matter of lumber supplies, with consequent restrictions on housing programs.

The forest fire season of 1944 was one of the most destructive on record. The total damage and cost amounted to more than $7,400,000 as compared to an annual average loss of some $4,800,000 for the past twenty years. This situation was due in large measure to a deficiency of both winter and summer precipitation. In some forest regions of Canada this condition was further aggravated by prolonged periods of drought, with the result that fires started and spread rapidly over large areas, making control operations very difficult. Another serious contributing factor was the difficulties under which protection organizations have been obliged to function for the past five years because of man-power shortages and enlistment of key personnel.

The forest fire situation in Canada to-day is unsatisfactory for the reason that the toll of forest fires varies with the weather conditions; also, public appreciation of the importance of the problem is seriously lacking. This situation was true in normal pre-war years and no change can be expected until the protection organizations throughout Canada are adequately staffed and supplied with essential facilities for the prevention, detection, and suppression of fires. These items constitute fundamental control measures and in themselves are not enough to stop the present rate of forest destruction. They must be backed by wholehearted co-operation of the general public.

For the most part the work of the Forest Products Laboratories is devoted to problems dealing with the prosecution of the war. As was to be expected, many new developments of importance in wood utilization have resulted from research conducted by the Laboratories during the war. Consequently demands increased for information and assistance in the application of new techniques for peace-time purposes, particularly where economic factors were involved.

War conditions, including the lack of trained foresters, continued to limit silvicultural research activities, both on forest experiment stations and outside. On the Kananaskis, Petawawa, and Acadia Stations, the time of the limited staffs was almost wholly taken up with providing useful work for prisoners of war or alternative service workers. These were employed in cutting fuelwood, mine props, and other forest products, to help meet existing shortages. Such operations resulted in the improvement of timber stands. Alternative service workers supplied the main source of personnel for protection of these areas from fire.

FOREST ECONOMICS

During 1944 the acute shortage of woods labour experienced during the previous year was eased somewhat, but the available supply of forest workers was still insufficient. Preliminary estimates of production of sawlogs and pulpwood indicate some improvement over 1943, but it was not possible to produce enough sawn lumber, pulp, and paper to satisfy all demands.

It has been estimated that approximately 2,800 million feet board measure of lumber were consumed in Canada during the year and nearly 1,900 million feet were exported. The larger part of the Canadian consumption was used for purposes directly or indirectly concerned with the war effort, and supplies available for the construction of new homes were consequently restricted. Of the Canadian consumption 50 per cent was used for all types of construction—military, industrial, and residential; 23 per cent for boxes and cratings; 23 per cent by railroads and essential mines; and 4 per cent miscellaneous purposes. Of the total exports of lumber, more than 90 per cent went to the United Kingdom and the United States, the quantities received by these countries being approximately equal. Production of newsprint paper amounted to nearly 3 million tons, a slight improvement over the previous year but about 14 per cent lower than the peak production of 1941. Canada continued to occupy the position of chief supplier of newsprint to the United States and also shipped substantial quantities to many other countries.

Government controls over the production and distribution of forest products continued in force throughout the year, for the purpose of ensuring maximum promotion of the war effort and also fair and equitable distribution of available supplies among different classes of consumers, both domestic and foreign.

The rate of utilization of standing timber in 1944 was slightly greater than in 1943 and losses from forest fires were about equal to the previous ten-year average. Serious losses were caused in Ontario by a severe infestation of the spruce budworm and the eastward movement of this outbreak gave cause for considerable concern. Average annual consumption and destruction of Canada's reserves of merchantable timber, during the ten-year period 1934-43, totalled 4,032 million cubic feet of standing timber. Distribution of this total depletion is shown in the following table:—

Average Annual Depletion, 1934-43

	Millions of Cubic Feet
Volume used	2,896
Merchantable timber burned	436
Destroyed by insects, etc	700
	4,032

Approximately 71 per cent of the total depletion was used and 29 per cent destroyed, during the ten-year period. Replacement of depletion required an average annual growth rate of 14 cubic feet per acre throughout the 275 million acres of forests that are classed as accessible and productive. Comparison of average annual depletion during four years of war with the average for a corresponding pre-war period shows that there has been an increase of about

20 per cent. The effects of this increased drain on the forests have been accentuated by the concentration of logging operations in the best and most easily accessible stands of timber. This tendency, though unfortunate, has been unavoidable under war conditions, because it has been necessary to get the highest possible production per man from the limited labour force available. It must be recognized, however, that continuation of this practice will inevitably result in higher-cost wood in the future.

The relative importance of the principal branches of the forest industry in 1943 is indicated in the following table:—

FOREST INDUSTRIES

Summary of Principal Statistics, 1943

	Capital Invested	Employment	Salaries and wages	Net Value of Products	Gross Value of Products
	$	Man-years (1)	$	$	$
Woods operations	281,000,000	107,790	180,000,000	205,000 000	268,615,283
Lumber industry	115,273,788	43,954	49,564,303	91,714,000	195,885,336
Pulp and paper industry	667,458,143	37,020	71,199,422	165,485,944	345,653,470
Wood-using industries	124,701,572	45,650	57,699,745	90,860,922	187,904,552
Paper-using industries (not including printing trades)	66,328,954	17,975	23,647,948	51,008,498	115,749,341
Total	1,254,762,457	252,389	382,111,418	604,069,364	1,113,807,982

(1) 300 working days.

The net value of the products of all the forest industries in 1943 was 8 per cent greater than in 1942, and 60 per cent greater than in 1939. Increases in the gross or sale values of products of the three chief branches of forest industry in 1943, as compared to 1939, were as follows: woods operations 70 per cent, lumber products 96 per cent, pulp and paper products 66 per cent.

AERIAL FOREST SURVEYS

This Section continued to operate with a staff of only two men. Although the output of work that was possible under the circumstances has been small, some significant advances in technique were achieved. A simple stereoscopic instrument was developed in co-operation with an officer from Harvard University. The monoscope, a transferring instrument designed and tested during the previous year, was put on the market. Very favourable comments have been received from those who have acquired this instrument. One of its most remarkable features is the ease with which inexperienced personnel can become proficient in its use.

A display of air photographs and maps, illustrating their use for forestry purposes, was prepared for exhibit at an international convention on mapping held in Brazil. This display was highly commended.

A member of the staff visited the Northeastern Forest Experiment Station and the Harvard Forest in the United States in order to study their methods and techniques in the use of air photos for forestry purposes. The annual meeting of the Quebec Society of Photogrammetry was also attended.

Two sheets of the national forest inventory series of maps, covering a portion of Prince Edward Island, have been completed. Preliminary forest maps of certain areas in the Yukon Territory and in northern Quebec were prepared from trimetrogon photographs. A map of the Acadia Forest Experiment Station in New Brunswick was completed and a block established in Quebec for the study of rates-of-growth was also mapped. At the request of the Department of Veterans Affairs a sample map was prepared to illustrate a forest-cover classification which might be of use to the Land and Loans Branch of that Department.

A field trip was made to the Green River area in New Brunswick in co-operation with a joint committee investigating methods for the control of the spruce budworm.

Considerable progress was made in the preparation of plans for expansion of the work of the Section in the post-war period. It is hoped that ex-servicemen who received special training in photogrammetry may be employed in the preparation of a national forest inventory based chiefly on air photographs.

SILVICULTURAL RESEARCH

The co-operative arrangements with the Subcommittee on Tree Breeding of the Associate Committee on Forestry, National Research Council, made up of representatives of the Council, the Entomological and Pathological Divisions of the Department of Agriculture, and the Dominion Forest Service continued during the year.

Working conditions improved somewhat during the period: little new work was initiated, efforts being chiefly concentrated on maintenance of the nursery and various test plantations, and on physical improvements such as levelling, removal of rocks, and drainage. The late frosts and subsequent hot and dry weather afforded an unusual opportunity of observing relative hardiness of material under test.

Projects under way are chiefly concerned with development of plants from stem cuttings, study of various propagation media, and application of hormones to cutting stock. Strain testing of spruce, Douglas fir, hard and soft pines, larch, poplar, birch, and various minor species continued, a large number of plants being set out in test beds. A number of poplar and spruce crosses were tested.

Vermin control continued a problem. Poisoned bait seemed the most satisfactory protection against mice and porcupines, and arsenate sprays against various insect attacks.

Assistance in an advisory capacity has been given to provincial forest services and to pulpwood operators in planning investigations, particularly in connection with studies of conditions on cut-over lands.

In co-operation with the New Brunswick Forest Service, the Science Service, Department of Agriculture, and the Fraser Companies, a project has been initiated, having as its prime object exploration of the possibility of controlling outbreaks of the spruce budworm by means of properly planned cutting methods. The Green River drainage basin was selected as the locale, and a management and research working plan is being drawn up.

A cumulative record of yearly seed crops is kept, based on reports received from the several stations. Although the records are not yet full enough for reliable deductions to be drawn, some interesting trends are revealed. Medium or better crops may be expected as follows: balsam fir, cedar, white spruce, white birch, every second year; larch, white pine, every third year; hemlock, yellow birch, hard maple, every fourth year; black spruce, red pine, every fifth or sixth year. During the next few years, we may expect medium or better crops as follows: in 1945, red pine, white birch; in 1946, balsam fir, cedar, jack pine, white spruce, hard maple; in 1947, hemlock, larch, white pine, black spruce; in 1948, yellow birch.

A study of the forests of Newfoundland was made at the request of the Commissioner of Natural Resources, the Anglo-Newfoundland Development Company and the Bowaters Company. A report has been published in the *Forestry Chronicle*.

At the request of the Ontario Department of Lands and Forests, an examination was made of woodlots in the Galt zone with a view to a joint study of methods of management and growth.

Suggestions were offered to a pulp company for methods of study and management of tolerant hardwood stands.

As previously, war conditions restricted the publication of the results of research. It was, however, found possible to issue, in limited quantity, mimeographed material dealing with stand density yield tables as a means of determining increment, cost of brush burning, methods of establishing transect sample plots for use in study of cut-over lands, volume tables for hemlock, and a sample plot manual. It is hoped ultimately to issue the latter in printed form.

FOREST PROTECTION

In the Dominion as a whole, both the number of forest fires and the total area burned in 1944 were slightly greater than the average for the previous ten years (*see* Table I). Although the quantity of merchantable timber destroyed closely approximated the average figure, the value of the timber, young growth, and other property lost in forest fires was 53 per cent higher than the previous ten-year average. Fire-fighting costs were the highest on record since complete information first became available in 1923. Only in Ontario and Saskatchewan, and on lands administered by Dominion agencies were the total damage and fire-fighting costs lower than the average value for 1934-43.

An analysis of forest fires by causes is shown in Table II. As in 1943, the proportion of fires attributable to railway causes during 1944 was much higher than the preceding ten-year average. The war-time increase in railway traffic, scarcity of replacements for defective equipment, and shortage of personnel for inspection, repair, and clearing of rights-of-way, are probably responsible for this situation.

The number of fires of incendiary origin has been uniformly low during the war years. Fires resulting from other causes show no significant changes.

The number of prosecutions and convictions under provincial fire laws (Table IV) was approximately three times as great as in 1943.

Two lives were lost in forest fires in the Province of Alberta.

In contrast to the remarkably favourable fire conditions which prevailed throughout the country in 1943, no forest region of Canada received abnormally heavy and well-distributed rainfall during the fire season of 1944. As usual, however, there was much variation between the maritime and the continental climatic regions.

Nova Scotia and New Brunswick suffered more severely than other parts of Canada from prolonged periods of high fire-hazard. In both provinces the spring and summer were the driest for many years, resulting in exceptionally serious fire losses, as shown in Tables III and IV.

Rainfall in Quebec was quite normal during most of the season, although unusually dry conditions prevailed in some areas during September.

In central Canada, from Ontario to Alberta, the spring and early summer were the most critical fire-hazard periods. Light snowfall during the previous winter, and scanty spring rains, were experienced in the Plains region, but from June onwards conditions were relatively favourable.

A dry fire season occurred on the lower coast of Vancouver Island. Elsewhere in British Columbia weather conditions were about normal.

Forest-Fire Research

Routine studies of equipment and methods used in forest-fire hazard measurement were continued, on a small scale, at the Petawawa Forest Experiment Station. An investigation of the effect on the fire hazard of various methods of slash disposal in jack pine stands was also commenced. Owing to the lack of personnel occasioned by war requirements, no additional research was undertaken.

TABLE I

Forest Fire Losses in Canada, 1944, Compared with 10-Year Average 1934-43

Item		Annual Averages 1934–43	Year 1944
Fires under 10 acres	number	.....	3,943
Fires 10 acres and over	"	.....	1,877
Total number of fires		5,542	5,820
Area burned—			
Merchantable timber	Acres	536,488	503,764
Young growth	"	647,196	401,017
Cut-over lands	"	350,928	759,279
Non-forested lands	"	813,449	739,001
Total area burned	"	2,348,061	2,403,061
Merchantable timber burned—			
Saw timber	M. ft. b.m.	736,949	738,496
Small material	cords	2,360,992	2,145,684
Estimated values destroyed—			
Merchantable timber	$	2,470,697	3,083,944
Young growth	"	872,882	763,671
Cut-over lands	"	258,911	787,880
Other property burned	"	372,906	1,449,222
Total damage	"	3,975,396	6,084,717
Actual cost of fire-fighting	"	818,108	1,328,338
Total damage and cost	"	4,793,504	7,413,055

TABLE II

Forest Fires in Canada, 1944, by Causes Compared with 10-Year Average 1934-43

Cause	Average 1934–43		Year 1944	
	No.	%	No.	%
Camp-fires	1,008	18	805	14
Smokers	925	17	1,077	18
Settlers	854	15	816	14
Railways	256	5	838	14
Lightning	983	18	846	15
Industrial operations	149	3	208	4
Incendiary	348	6	172	3
Public works	55	1	48	1
Miscellaneous known	442	8	593	10
Unknown	522	9	417	7
Totals	5,542	100	5,820	100

TABLE III

Statistics of Forest Fires by Regions, 1944

(Averages given are those for 10-year period 1934-43)

—	British Columbia		Alberta		Saskatchewan		Manitoba		Ontario	
	Average	1944	Average	1944	Average	1944	Average	1944	Average	1944
Fires—										
Total number	1,606	1,667	322	325	268	87	369	251	1,297	1,137
Caused by lightning....%	35	25	3	3	6	1	8	4	22	16
Areas burned—										
Merchantable timber....acres	50,639	20,033	150,082	250,455	59,423	4,444	36,829	49,538	136,029	73,365
Young growth.... "	58,580	88,929	189,873	190,548	247,395	4,210	33,052	34,086	61,305	19,704
Cut-over lands.... "	136,324	81,799	17,464	8,469	19,252	7,043	3,955	1,589	26,842	47,849
Non-forested lands.... "	81,468	315,387	238,883	273,186	188,986	31,829	156,184	37,139	81,875	27,973
Total....	327,011	506,148	596,302	722,658	515,056	47,526	230,020	122,352	306,051	168,891
Damage....$	788,068	652,525	915,595	1,707,352	227,271	32,241	137,371	182,387	861,410	252,467
Cost of fire-fightnig....$	193,702	338,993	81,087	80,806	70,658	15,000	30,354	8,789	219,499	246,802
Total damage and cost....$	981,770	991,518	996,682	1,788,158	297,929	47,241	167,725	191,176	1,080,909	499,269

—	Quebec		New Brunswick		Nova Scotia		Dominion Lands					
							National Parks		Indian Lands		For. Expt. Stations	
	Average	1944	Average	1944	Average	1944	Average	1944	Average	1944	Average	1944
Fires—												
Total number	1,017	1,542	225	341	308	391	69	29	55	49	7	1
Caused by lightning....%	5	11	5	15	0	1	12	3	11	12	14	0
Areas burned—												
Merchantable timber...acres	84,425	86,103	7,544	11,289	1,262	4,988	6,571	471	3,280	3,078	405	0
Young growth.... "	21,471	32,745	5,367	14,696	5,783	14,956	21,172	1,056	2,410	87	788	0
Cut-over lands.... "	131,503	454,637	9,773	151,328	1,012	5,240	4,117	1,324	643	0	42	1
Non-forested lands.... "	19,911	26,333	21,604	6,781	7,371	12,015	10,308	412	6,255	7,946	604	0
Total....	257,310	599,818	44,288	184,094	15,428	37,199	42,168	3,263	12,588	11,111	1,839	1
Damage....$	870,827	1,556,205	74,485	1,586,844	20,435	105,618	61,648	3,823	12,678	5,255	5,608	0
Cost of fire-fighting....$	158,812	475,280	21,850	112,040	19,937	44,020	17,484	1,430	4,192	5,174	533	4
Total damage and cost....$	1,029,639	2,031,485	93,335	1,698,884	40,372	149,638	79,132	5,253	16,870	10,429	6,141	4

TABLE IV

Fire Season, 1944—Comparative Statement by Regions

Regions	Increase or Decrease in Relation to Average for Period 1934-43			Proceedings Under Fire Laws		Deaths
	Number of Fires	Area Burned, Acres	Cost Plus Damage, $	Prosecutions	Convictions	
British Columbia	+ 61	+ 179,137	+ 9,748	66	58	0
Alberta	+ 3	+ 126,356	+ 791,476	116	98	2
Saskatchewan	− 181	− 467,530	− 250,688	1	1	0
Manitoba	− 118	− 107,668	+ 23,451	5	5	0
Ontario	− 160	− 137,160	− 581,640	50	46	0
Quebec	+ 525	+ 342,508	+1,001,846	74	71	0
New Brunswick	+ 116	+ 139,806	+1,602,549	94	66	0
Nova Scotia	+ 83	+ 21,771	+ 109,266	25	23	0
Dominion Lands	− 51	− 42,220	− 86,457	1	1	0
Canada	+ 278	+ 55,000	+2,619,551	432	369	2

ALTERNATIVE SERVICE WORK

DOMINION FOREST EXPERIMENT STATIONS

Alternative service work camps for conscientious objectors to military service were again maintained on the Petawawa and Kananaskis Experiment Stations. The men at these camps were employed under an arrangement with the Department of Labour.

Work performed was varied in character: of first importance, in some respects (in view of the shortage of casual labour), was fire protection. The men also cut a considerable quantity of fuelwood, over and above that required for use on the stations, which was available for sale, thus materially helping out the fuel situation. Other work included improvement and maintenance of roads, bridges, buildings, and telephone lines; extraction of sawlogs, mine timbers, fence-posts, splintwood, and other material, both for government use and for sale; forest nursery work, tree-planting, and silviculture generally. All this work was carried out under the supervision of technical officers of the Dominion Forest Service.

An average of 102 men monthly is noted for the Kananaskis Station, with a minimum of 50 men and a maximum of 153. They turned out 4,700 cords of fuelwood, 600 fence-posts, and 1,693,810 linear feet of mine timbers. At Petawawa, the monthly average of workers was 69, with a maximum of 114 and a minimum of 45. Their output included 161,000 feet board measure of sawlogs, 3,300 cords of pulpwood, 3,343 cords of fuelwood, 31,000 feet board measure of splintwood, 6,709 poles, and 55 fence-posts. Man-days worked totalled 19,984 for Petawawa and 26,278 for Kananaskis.

PRISONERS OF WAR AND INTERNEES

Prisoners of war and internees on Dominion Forest Experiment Stations were engaged chiefly on road construction and maintenance, and the salvaging of material from silvicultural operations under the direction of officers of the Forest Service. During the year they turned out over 2,100 cords of fuelwood and 81,958 linear feet of mine props.

FOREST PRODUCTS LABORATORIES

Problems pertaining to the prosecution of the war continued to constitute the greater portion of the Laboratories' activities. During the latter part of the year, however, heavy demands were made for assistance in connection with

special rehabilitation problems and particularly with problems associated with public utilities and housing in which timber will be used extensively. Wood utilization has advanced very rapidly during the war and many developments of importance have resulted. A great deal of interest has been manifested in the adaptation of these new techniques in wood utilization to peace-time purposes. This has required a good deal of research on the part of the Laboratories, especially as, under peace conditions, economic factors are of greater concern than under the urgency of war necessity.

Following is a brief résumé of some of the more important matters which have received attention during the year. For obvious reasons specific reference to much of the confidential war work is not included.

Main Laboratories—Ottawa

Division of Timber Mechanics

With increased attention to packaging to meet tropical conditions container design and testing received renewed impetus. The Laboratories collaborated closely with the Canadian Packaging Committee in the setting up of packaging codes and in approval tests on packages for specific materials.

Improvements in the formulation of resin glues have required increased attention, much of the testing being carried out at the request of the Royal Canadian Air Force. However, an increasing amount of such work has been done at the request of the manufacturers with a view to post-war markets. Plywood testing has also maintained its volume, and a considerable proportion of this has been carried out for the purpose of controlling the gluing operations of sub-contractors engaged on manufacturing components for wooden aircraft. In this connection an investigation was made of the bonding qualities of certain United Kingdom adhesives.

A study to determine the effect of differences in the moisture content of veneers on the strength of joints made with urea resins was completed during the year. This study was commenced to obtain data on the strength of joints made in plants where no measures had been taken to control moisture.

There has been considerable doubt regarding the strength and durability of heavy white elm in comparison with rock elm of the same density. Shortage of stocks of the latter species has turned attention to the practicability of using high-density white elm as a substitute. Rejection of high-density white elm by rigid interpretation of specifications would greatly reduce the available supply of commercial rock elm. An investigation was commenced to determine the relative strength and durability of the two species and to find whether a density range existed common to both species, which would make them interchangeable within this common range.

A study was initiated, at the request of a large power company, to determine the effect of red stain and pocket rot upon the strength of jack pine poles. Tests were undertaken on 125 poles.

The reduction in available supplies of large structural timbers has created a condition requiring attention. It has been shown, however, that lamination of smaller-sized timbers by gluing can be satisfactorily, and in some cases economically, carried out. A study was started to obtain data on various methods of lamination, using casein and urea-formaldehyde glues, on different methods of applying bonding pressure, and as to the effect of different grades of lumber on the strength of the assembly. Other experiments were made to determine the effect of using species of higher mechanical strength in the flanges (where the maximum stresses occur) and weaker species in the central portion of the assembly.

A number of small I-beams were prepared using casein, urea and phenol-formaldehyde glues in their fabrication. One-third of these were given a 6-pound creosote treatment and exposed to the weather, along with an equal number of untreated beams. The other third of the beams were placed under cover away from the direct action of rain and snow. Samples of these beams will be tested at intervals over the next ten years to determine the effects of time and exposure upon the strength of the joints and to discover if there is any deterioration in the timber.

A number of problems pertaining to failure of wooden aircraft components, either in the process of manufacture or in subsequent flying service, were studied.

The study of temperature and humidity changes in exposed wooden aircraft was completed both at the Ottawa and Prince Albert stations. This is part of an international project in which several countries are collaborating.

Members of the staff of the Division have been consulted by the Department of National Defence in such matters as the suitability of species for specific military use, methods of construction, the design of skis for field guns, the packaging of stores, etc.

DIVISION OF WOOD PRESERVATION

Tests were made on preservatives used to protect wood products from decay and insect attack during shipment and storage overseas, and on fire-retardant paints. Accelerated laboratory tests to determine the resistance of treated and untreated wood to decay were developed, garden soil being used to maintain the wood samples at a suitable moisture content.

Replacement of untreated telephone and telegraph poles is difficult during the war, and work was continued on ground-line treatments which will extend the service life.

Plywood made with waterproof resin glue is much used for overseas shipments, and studies were made on the penetration of wood preservatives through the glue line.

Standard creosote for use at the wood preserving plants in the Prairie Provinces must be hauled long distances in tank cars. Tests were made to develop local production of suitable preservatives by mixing a medium-temperature tar from British Columbia with lignite tar distillate from Saskatchewan.

Resin glues with the greatest resistance to water require the application of heat as well as pressure to set the glue. A process was developed to apply the necessary heat by passing an electric current through small copper wires embedded in the glue line: the process can also be used with cold-press glues. The glued assembly can be removed from a press or clamps in minutes instead of hours.

Work was continued on recording the service life of treated and untreated timber.

DIVISION OF LUMBER SEASONING

Several charges of spruce, balsam fir, and Douglas fir, for use in the manufacture of glued laminated beams for testing purposes, were dried in the Laboratory kiln.

Great difficulty was encountered in obtaining dry box-shooks for export egg cases and on request assistance was rendered to the Department of Agriculture and some manufacturers in connection with this problem through the use of the Laboratories' semi-commercial kilns. Assistance was rendered to Air Force Inspectors in evaluating the significance of moisture content of wood and plywood in the construction of aircraft.

A representative of the Laboratories attended a conference at a plant in Toronto on conditions necessary to obtain the correct moisture in aircraft wood in using specific glues in aircraft construction, and to plan means for humidifying the plant. The system recommended by these Laboratories was adopted later.

During the year, information on lumber seasoning was supplied to both government and civilian organizations as requested. Some of the problems treated were:—drying red pine clears and tests on samples which had been rejected by the British Timber Controller on account of resin accumulation, the results showed that the strength of the lumber was not affected and that most of the resin and discoloration dressed off during manufacture: drying schedules and operation of dry kilns to prevent case-hardening, brown stain, checks and other defects: design of natural circulation kilns: seasoning elm with crystal urea: drying lumber by high-frequency current.

DIVISION OF TIMBER PATHOLOGY

It is becoming increasingly difficult to obtain sufficient rock elm to meet the industrial demand for that species; consideration has, therefore, been given to the use of white elm as a substitute. In this connection, a comparative study of the relative resistance to decay of the two species was undertaken.

One hundred newly cut jack pine poles, selected because it was thought they contained red stain or red rot, were submitted to the Laboratories for testing. On examination, considerable variation was noted in the discolorations present. Sections for study were obtained from 31 poles. Several fungi were isolated, some of which are wood-rotting species.

Two types of discoloration in spruce were examined on request. In one the discolored tissues contained heavy deposits of resin, but showed no fungal attack; in the second, discoloration was due to incipient decay.

Fungi causing rot in Douglas fir boat timbers and in Douglas fir bridge timbers were identified and found to be fungi which continue to develop in timber in service.

Cultures were set up to test the growth of fungus on basswood excelsior. The fungus was found to maintain vigorous growth as long as a suitable moisture content continued.

With a view to obtaining wood from which a large amount of the lignin had been removed by biological processes, pieces of several species of softwood were inoculated with *Trametes pini* under aseptic conditions.

Miscellaneous inquiries dealt with during the year had reference to decay in jack pine, western red cedar, and eastern white cedar; to defects in birch plywood and veneer; to the resistance of glues to the attack of micro-organisms; to methods of controlling blue stain in softwoods, and to the elimination of mould in dry kilns and in wine vats.

DIVISION OF WOOD CHEMISTRY

A small-scale experimental plant was designed for the manufacture of wood sugars from sawdust and waste wood and its construction was well advanced toward completion in spite of great difficulty in securing the acid-resistant materials required. Various types of analyses on wood, lignin, and sugar solutions were carried out in order to develop techniques for experimental work in wood hydrolysis.

Structural boards were made from waste sulphite liquor and Scholler lignin. The experiments indicated that higher temperatures than those obtainable with the equipment available at the time were necessary and steps were taken to provide the requisite temperatures by the installation of a high-pressure electric boiler.

Birch veneers (or shavings), 1/32 of an inch in thickness, were impregnated with a concentrated solution of waste sulphite liquor, dried, and pressed into boards. The properties of the products indicated the necessity of higher temperatures than those used. Work is continuing with improved facilities.

The lignin residue obtained by the hydrolysis of wood by the Scholler process was compounded with sawdust and other ingredients and pressed into boards, which showed some promise. Experiments were carried out on the use of bark in the manufacture of plastic products.

A brief description of the more important products that have been developed, together with an estimate of the status of so-called improved woods, in the general field of wood utilization, was presented at a meeting of the Canadian Pulp and Paper Association.

Work was initiated, the object of which is to determine the effect of methylolurea treatment on the properties of wood, and the applications in industry to which this treatment might apply.

The existing processes for wood hydrolysis use either highly concentrated hydrochloric acid at room temperatures or dilute sulphuric acid at elevated temperatures and pressures. Both methods require expensive equipment to withstand the conditions applied. An attempt was made to develop a method of wood hydrolysis, utilizing sawdust and dilute acids at elevated temperatures, but at atmospheric pressures, using flue gas as a source of heat.

The great demand for building material has stimulated investigations in the utilization of sawdust as a basic material for fibreboard. It was found that good panels may be made from sawdust mixed with blood fresh from the slaughterhouse, or with soluble dried blood. In order to prevent bacterial attack, small amounts of phenols are added. As the amount of blood available is limited, other protein materials were tried. It was found that alkali-treated castor pomace is suitable as a binder. A patent has been obtained for this process. Another material which is considered to have possibilities as a binder is drip oil from gas carburetting plants.

In connection with several failures in wooden aircraft, an investigation was made of the alkalinity of casein glues. It was found that several of the commercial casein glues show pH values which are considered to be above the desirable maximum and that the failures were probably attributable to this fact.

DIVISION OF TIMBER PHYSICS

Experiments undertaken by the Laboratories in 1943 showed that it is possible by introducing chemicals into the ascending sap of trees to extend the period during which bark is readily removed by peeling. Tests were continued in 1944 on black spruce and aspen, the species treated in 1943 which were found most resistant to treatment, with chemicals not previously tried. A report of the work of 1944 was presented at the Annual Meeting of the Woodlands Section of the Canadian Pulp and Paper Association in January, 1945.

In connection with the investigation of the relative properties of rock elm and white elm, a study was made of the relation between rate of growth and density of the species. A study was made of the defect known as "back check", caused by loose cutting of veneers, and its significance in the use of veneers in aircraft construction.

Further assistance was rendered to the Canadian Standards Association in setting up a specification for the use of planer-mill shavings and sawdust for insulation, particularly in relation to certain requirements of the code pertaining to electric wiring.

Assistance was rendered to war services in determining causes of failures in wood components in aircraft, in identifying species of wood used in the construction of war materials, in examining defective material used in timber structures, and in training inspectors engaged on the construction of wooden aircraft and other wood construction.

Vancouver Laboratory

The Vancouver Laboratory is operated as a branch of the Ottawa Laboratories in co-operation with the University of British Columbia. Its work is chiefly concerned with the more efficient utilization of the woods of British Columbia. During the past year problems connected with the war and with plans for post-war research have been matters of principal concern.

DIVISION OF TIMBER MECHANICS

Standard tests were completed on one shipment of air-dried amabilis fir and well advanced on a shipment of grand fir, both from Vancouver Island. Testing was completed upon air-dried western hemlock of aircraft quality to determine the effect of kiln seasoning at various temperatures upon the strength of the wood. Tests for the acceptance of glues by the Royal Canadian Air Force within standard specifications, and tests covering gluing in aircraft construction and repair in British Columbia were carried out as required.

An extensive series of tests in bending of different grades of structural size timbers of Douglas fir and western hemlock, carried out in co-operation with the British Columbia Lumber and Shingle Manufacturers Association, was completed. Grading of this material was carried out in accordance with both domestic and export grading rules.

The comparative holding-power of box nails, coated with different cement treatments, for use in the manufacture of boxes and crates for shipping war materials to the Pacific theatre, was investigated. Shear tests were made on three-ply western birch to determine the effect upon the strength of the glued joint when made up with casein glue, treated with a mould-resistant preservative, and placed under conditions favouring bacterial action for varying periods.

Co-operation was extended to an aircraft production firm in the examination and testing of materials for aircraft tail assemblies and in the design of new jigs and presses.

Assistance was rendered to the Inspector of Naval Services in British Columbia regarding specifications for ships' masts and booms and their preservative treatment against decay. Tests were carried out for a local shipbuilding company to determine the comparative strength of scarfed and unscarfed glued joints in Douglas fir plywood.

A good deal of work was carried out in co-operation with the Royal Canadian Air Force, the Timber Control, the Naval Service, the British Ministry of Supply, Inspection Boards, and producers to determine the application to production of war materials of various specifications and of new materials, in clarifying the application of specifications, in the improvement of production practices, in the use of substitute materials, and in the testing of associated materials where other means were not available.

DIVISION OF TIMBER PRODUCTS

Seasoning studies were carried out on 1-inch and 2-inch western hardwood furniture stock to determine the rate of moisture absorption after kiln-drying. Information was assembled regarding the heat production capacity of individual sawdust burners and on a type of primary burner which might be used to

reduce the temperature of the fuel gases so that they could be satisfactorily applied to a "shed dryer" for lumber seasoning. A charge of mixed hardwoods and softwoods, treated with dimethylolurea, was kiln dried in order to observe the effect of the treatment on kiln-drying properties. No degrade was noticeable but penetration of the chemical proved to be uneven.

Assistance was extended in carrying out experiments on the drying of western hemlock sawdust in a rotary fish dryer in order to make it suitable for use in domestic sawdust burners. In co-operation with the British Columbia War Metals Research Board studies were made of the quality of charcoal obtained from softwoods on Vancouver Island and their suitability for use in the smelting of iron ore.

Information was prepared as to the volume of wood waste available from British Columbia sawmills for the manufacture of alcohol.

Experiments were carried out on the extent of fluorescence of wood-destroying fungi commonly found in Sitka spruce. Studies were made under laboratory-controlled conditions to determine whether certain rot fungi found in standing timber continue the rotting process after manufacture, storage and use, and, if so, to obtain some idea of the progress of decay.

Information was assembled for local naval authorities on the comparative properties of yellow cedar and mahogany for use in outdoor locations; also as to the use of iroko as a substitute for Burma teak in naval construction.

In addition, many matters of less importance were dealt with, including the relative durability of Canadian woods for use in water-cooling towers, the suitability of treated western hemlock for wharf construction, the cause of internal rot found on framing large Douglas fir timbers, and the possibility of drying Douglas fir plywood after treatment with zinc chloride.

GENERAL

Members of the staff were in close touch with proceedings of the Royal Commission on Forestry in British Columbia, and furnished evidence on certain questions of research in forest products.

The Laboratories participated with the Technical Advisory Committee on Forestry of the British Columbia Scientific and Industrial Research Council in several meetings to discuss projected studies of forest and forest products problems.

An officer of the Laboratory spent some time in surveying modern methods of wood utilization in Washington and Oregon, particular attention being directed to the problems of logging and sawmilling methods and waste utilization.

Assistance was extended to a ship-building firm in determining the relative values for insulation purposes on government ships of ground cork, spruce, and cedar sawdust bonded with magnesite.

Many mill operators interested in the possibility of closer utilization of the waste material resulting from manufacturing processes sought assistance in studying plans for the manufacture of insulating board, plastics, moulded items, distillants, etc.

Assistance was rendered in the production of veneers and plywood from Engelmann spruce, in the wider use of minor species as substitute materials, in damage to buildings by ants, termites, and other insects, and in the use of cascara bark and wood for medicinal purposes.

Pulp and Paper Research Institute of Canada

The Montreal Laboratory of the Forest Products Laboratories is a part of the Pulp and Paper Research Institute of Canada, which is supported jointly by the Dominion Government, the Canadian Pulp and Paper Association, and McGill University. The work of the Institute is under the supervision of a General Director who is responsible to a Joint Administrative Committee consisting of representatives of the three constituent bodies.

FUNDAMENTAL RESEARCH STUDIES

Fundamental work during the past year comprised investigations of the chemical properties and behaviour of cellulose, the principal constituent of wood. Some success was achieved in applying to unswollen preparations of cellulose a method of estimating the collodial surface of swollen preparations. A study of oxycelluloses along certain lines was undertaken. An investigation was commenced to verify a theory that certain groups in cellulose are mainly responsible for its moisture sorption and bonding characteristics. Studies were initiated to determine the nature of the reaction between halogen or halogen-containing substances and wood.

APPLIED RESEARCH STUDIES

A new type of optical instrument for measuring the printing smoothness of paper was developed and partly constructed at the Institute. It has not yet been fully tested, but preliminary results are promising. An attempt was made to develop a method, from both the theoretical and the experimental aspects, for measuring the oil absorption of paper.

Progress in developing an instrument for measuring the folding quality of box board was temporarily retarded when the investigation revealed a hitherto unsuspected variable factor, the compressibility of the tympan, necessitating a study of its effect on the operation.

A critical examination of methods of analysing sulphite waste liquor is being conducted with the idea of standardizing those considered most useful.

A method of measuring the total surface area of a pulp was studied as one stage in the development of an improved method of measuring the quality of pulp for making paper. Also involved in this study are the degree of packing in a mat of pulp fibres and the rate of drainage of water therefrom.

A preliminary study of the efficiency of present methods of driving pulpwood in rivers and streams in the spring was begun. As in previous studies of logging operations, opportunities were found for effecting considerable economy.

A further series of tests of pulp was conducted in connection with a study of the preparation of pulp for board. A great number of reference tests were made on samples submitted by the industry and many check tests were made on instruments of types used exclusively by the industry.

WAR WORK

Valuable assistance was given to the Government on problems connected with the war which required the use of special equipment at the Institute or the special qualifications of Institute staff in both fundamental and applied research.

SURVEYS AND ENGINEERING BRANCH

J. M. WARDLE, DIRECTOR

During the fiscal year the Surveys and Engineering Branch undertook, for the first time since the early days of the war, important work that was not directly related to the war effort. Such work embraced surveys and engineering and scientific investigations associated with post-war needs and development programs. While the urgency of work arising from the war still dominated operations of the Branch, the pattern of extensive post-war activities became evident. The Ottawa headquarters of the various Services of the Branch continued their administrative and technical work, and afforded as usual their very effective co-operation.

In Ottawa the Dominion Observatory staff gave special attention to astronomical and geophysical problems submitted from time to time by War Departments of Government. Substantial improvement was made in time service equipment. National time signals are now transmitted direct to the Canadian National and Canadian Pacific Railway systems for distribution to their various offices across Canada. Gravimetric and magnetic field traverses were continued in New Brunswick. In the field of seismology full-time recording stations were operated at Victoria, Saskatoon, Ottawa, Seven Falls, and Halifax. The relatively severe earthquake of September 5, 1944, centring in the Cornwall-Massena area, was investigated in the field by Observatory officers and a report published. Rock burst studies were continued at Lake Shore Mines, Kirkland Lake, Ont.

The Astrophysical Observatory at Victoria continued its research work with satisfactory results, although the program was curtailed by the absence of three members of the staff on work related to the war. Instruction of various service personnel was continued. Improvements were made to instrumental equipment including a spectrograph and a graphical intensitometer. While observing conditions were below normal in the winter of 1944-45, observations were made on 162 nights and 1,542 spectrum plates were obtained. Progress was made in the study of several star groups including solar type stars and groups of stars in Cygnus. Results of research and study were made available to the scientific world generally through the publication of five articles, and seven papers were presented at meetings of scientific societies.

In the field of water and power, the Dominion Water and Power Bureau continued its basic work of collecting water resources data with a somewhat enlarged program. Between 1939 and 1943 a rapid expansion in hydro-electric power development took place across Canada because of the need of power for war industry. By the end of 1943 this expansion was practically at an end and during the year under review only one large new development was completed, namely, on the Kootenay River in British Columbia near Brilliant, where there was an installation of 68,000 horse-power.

The immediate post-war problem in the field of water power will be the absorption of the greatly increased power now available for peacetime use, in the industrial, agricultural, and domestic fields.

On January 1, 1945, Canada's water-power development was 10,283,763 horse-power which represents approximately 20 per cent of the total possible development.

Preliminary plans were made during the year for methodical measurements of glacial recession in the head-water areas of some of the larger rivers in Western Canada. Information previously obtained through efforts of the

Alpine Club of Canada was compiled in convenient form and is a very valuable contribution to the proposed program. Information on glacial recession which is showing marked acceleration in the Selkirk and Rocky Mountain Ranges, will be extremely useful in estimating future flow regimen of rivers such as the Columbia and Saskatchewan.

A main feature of the work of the Engineering and Construction Service of the Branch was the completion, in the autumn of 1944, of the highway between Prince Rupert and Kitwanga, British Columbia, which was constructed for national defence purposes. This project consisted of the building of 111·6 miles of new road, construction being as difficult as any ever attempted in the Dominion. Work was begun in May, 1942 and the entire project was completed by November, 1944. The total construction cost including location surveys and engineering was $11,069,054.19.

A large number of engineering investigations were undertaken for the Indian Affairs Branch in different reserves across Canada, and for the Lands, Parks and Forests Branch. The operation of construction camps for Japanese evacuated from the Pacific Coast was continued on two major road projects, namely, the Hope-Princeton and the Yellowhead-Blue River Highways.

A large amount of survey and engineering work was undertaken by this Service in connection with the post-war reconstruction program of the Department. This work included surveys of highways, water and sewer systems, bridges, and power projects, and the preparation of plans and estimates. The Architectural Division investigated building sites, and completed sketches, detailed drawings, contract and specification forms covering various building projects for other branches of the Department.

The main operations of the Geodetic Service of Canada during 1944-45 consisted of basic triangulation work, precise levelling, and the determination of latitude and longitude at selected points in Northern Canada for horizontal map control.

A highlight in triangulation operations was the completion of the triangulation net through Newfoundland to connect with the Canadian net at the Strait of Belle Isle. The completion of this project was the result of ten years of highly technical field and office work. The work in Newfoundland was co-operative, Canada supplying the technical officers and equipment and Newfoundland paying all field expenses.

Another important feature was the resumption of precise levelling operations in the field which had been discontinued at the outbreak of war. Levelling parties were placed on the Alaska Military Highway, precise levels being carried from Slave Lake, Alberta, to a point 75 miles south of Fort Nelson.

Several special surveys of a highly technical nature were made for the Department of National Defence, one or two of these being at the instance of United States authorities.

The maintenance of the 5,527 miles of boundary line between Canada and the United States, and Canada and Alaska, was continued by the staff of the International Boundary Commission. Work was undertaken on the Highlands section of the boundary between Maine and Quebec, and along the St. Marys River between Lakes Huron and Superior. On the Pacific Coast maintenance was undertaken in the Portland Canal area. Usual field inspections were made and several special projects given consideration. Canada was fortunately able in 1944-45 to do her full share of boundary line maintenance.

The Hydrographic Service of Canada continued its work in the production and distribution of hydrographic aids to navigation. New navigation charts were prepared from surveys, volumes of Pilots and Sailing Directions were published, and the annual Tide Tables for the Atlantic and Pacific Coasts were issued. The closest co-operation was maintained with the Naval Service and its needs were given priority in hydrographic operations. In the east, hydrographic surveys were undertaken on the Nova Scotia Coast and in the Gulf

of St. Lawrence. Special survey work was undertaken in Newfoundland and Cape Breton for the Naval Service. On the Pacific Coast a large amount of hydrographic survey work was undertaken at various points between the Strait of Georgia and Grenville Channel. The Hydrographic ship "Wm. J. Stewart" was badly damaged early in June through striking Ripple Rock in Seymour Narrows. This accident reduced the season's work and required the extensive use of launches.

A substantial increase in the demand for standard navigation charts was noted in the past fiscal year. In addition the progress of the war in the Pacific resulted in an urgent demand for new navigation charts covering shipping routes between Vancouver Island and the mainland. Plans were made for expanded hydrographic survey work after the war particularly on Canada's inland waters.

The Legal Surveys and Map Service again produced a great number of maps and plans including air navigation charts, special maps, and compiled maps for general purposes. The great demand for air navigation charts across Canada required special facilities for the plotting of trimetrogon air photographs and good progress has been made by the plotting division. Early in the year, at the request of the Royal Canadian Air Force, the Legal Surveys and Map Service co-operated in the preparation and issue of the "Canada Air Pilot" and the "Pilot Hand Book". These new publications, which are kept up-to-date, give detailed information of air fields across Canada.

A large program of legal survey work was begun in connection with the development of the Canadian Northwest. Base line and meridian surveys were made; and legal surveys were undertaken in the Yukon Territory. A legal survey of the Alaska Highway was begun and further progress made in fixing the location of the British Columbia-Yukon Boundary Line in the vicinity of the highway. Various surveys were made for the Indian Affairs Branch.

Map compilation and printing continued at a high peak. During the year 460 maps were published, total map sheets produced being 1,321,615. In addition air navigation data were overprinted on 354,981 air charts. Many of the latter charts were printed in from two to nine colours.

The incidence of post-war planning activities on work related to the war resulted in the overloading of practically all the facilities and personnel of the Surveys and Engineering Branch. The additional technical staff required could not be obtained and it was impossible to complete programs as promptly as desired. It is hoped that within the next year this serious difficulty will be substantially overcome.

The Surveys and Engineering Branch undertakes its work through its own votes and through funds made available by other branches or Government departments where work is done in their interests.

The following tables give information on expenditures and revenue for the fiscal year ended March 31, 1945:—

Statement of Expenditures, Fiscal Year 1944-45

Regular Votes	$1,610,166.30
Statutory Votes	50.00
War Appropriation Votes—Alternative Service Work Camps	365.94
Prince Rupert-Terrace-Cedarvale Highway	2,499,297.47
Japanese Nationals	510,765.94
Triangulation Work in Newfoundland	1,918.73
Alaska Highway (Engineering and Construction Service)	11,948.12
" " (Legal Surveys and Map Service)	19,560.68
Post-War Planning	224,425.13
War Risk Zone Bonus	2,875.00
Air Maps and Charts (Legal Surveys and Map Service)	28,411.01
Bay of Fundy Tidal Power Investigations	25,000.00
	$4,934,784.32

Expenditures of moneys made available by other branches and departments as follows:—

	Regular Votes	*Special Votes*	*Trust Funds*	*Total*
To Engineering and Construction Service from:				
Lands, Parks and Forests	$ 9,995.37			$ 9,995.37
Indian Affairs	50,941.77		$ 8,396.78	59,338.55
				69,333.92
To Legal Surveys and Map Service from:				
National Defence (Air)		$ 3,402.02		3,402.02
Pensions and National Health	774.33			774.33
National Research Council		190.50		190.50
				4,366.85
To Geodetic Service from:				
National Defence (Naval)		309.01		309.01
To Dominion Water and Power Bureau from:				
Department of Fisheries	99.23			99.23
Grand Total				$5,008,893.33
Statement of Revenue, Fiscal Year, 1944-45				
Revenue				$ 186,520.19

DOMINION OBSERVATORIES

The Dominion Observatories at Ottawa and Victoria continued work on various programs, and, as in previous years, special attention was given to geophysical and astronomical problems associated with current Army, Air Force, and Naval developments.

DOMINION OBSERVATORY, OTTAWA

At the Dominion Observatory, Ottawa, satisfactory progress was made in various improvements to the time service equipment. Arrangements were completed for direct transmission of national time signals from the Observatory to the Canadian National and Canadian Pacific Railways, and distribution was established over their entire systems. Gravimetric and magnetic field traverses were continued in New Brunswick.

Observing conditions were somewhat below normal, but satisfactory results were obtained from observations made.

Two papers on geophysics were presented at the May, 1944, meeting of the Royal Society of Canada, "Geophysical Surveys in New Brunswick", by A. H. Miller, and "Report of Progress on Rockburst Investigations at Lake Shore Mines", by E. A. Hodgson. A paper on the Cornwall-Massena Earthquake of September 5 was presented by Dr. Hodgson to the Cornwall Chemical Association. Further articles on the rockburst problem were published in the Journal of the Canadian Institute of Mining and Metallurgy, and in the Journal of the Royal Astronomical Society of Canada.

The Junior Astronomical Club remained active and held fourteen meetings. Bylaws were drafted and accepted.

The Observatory was open to visitors each Saturday evening, and the equatorial telescope was made available when the sky was clear. Student classes and groups of daytime visitors, including an R.C.A.F. group of navigational instructors from Rivers, Manitoba, were given popular talks on general research and equipment. Lantern slides were placed on loan from time to time for popular lectures, and for school instructional purposes.

D. B. Nugent, who was in charge of the Position Astronomy division, began his retiring leave on January 2, 1945, owing to ill health. W. E. W. Jackson, in charge of the Magnetic Observatories at Meanook and Agincourt, completed six months retiring leave on March 31, 1945. The Librarian, J. H. L'Abbe, completed his retiring leave on September 20, 1944, and died on February 10, 1945.

Position Astronomy.—With the meridian circle 1,228 fundamental observations were made for right ascension and declination, 126 readings of instrumental constants were made, and computations carried on.

Observations with the reversible transit instrument for determining correct time were made on 128 nights, and corrections to the Standard sidereal clock, Shortt 29, were computed from these observations. The two Riefler primary clocks were compared twice daily with Shortt 29, and the results used to determine definitive corrections to the latter, which gave the best performance. An improved temperature control was installed in the Standard sidereal clock vault. Two crystal controlled Primary Frequency Standards were in use, one belonging to the Observatory and the other to the Department of Transport, to afford a check on primary clock rates. The crystal supplied with the Frequency Standard at the Observatory did not function satisfactorily and a new crystal was supplied by the manufacturers.

Clock Shortt 29 continued to synchronize the two signal clocks designed and built at the Observatory, which control all mean time circuits, including the various time signals, circuits operating chronographs, minutes and seconds dials, seismograph shutters, and Government and outside clock systems, as well as the new service, which transmits time signals automatically over the entire systems of the two Canadian railways, commencing over Canadian Pacific Railway on January 22, and over Canadian National Railways on February 17.

Time signals were sent continuously by wire to the Canadian Broadcasting Corporation, National Research Laboratories, and the Monitoring Station of the Department of Transport. Time signals were broadcast continuously by the observatory station CHU on 3330, 7335, and 14670 kc., for a five-minute period daily except Sundays and holidays by the Department of Transport station VAA on 11990 kc., twice daily by the naval station CFH, Halifax, and through the Canadian Broadcasting Corporation chain of stations daily. From approximately June 1 to October 31, special time signals were sent continuously from 7 p.m. to 5 a.m. by VAA on 8330 kc. for the use of survey parties in Northern Canada. Correct time was given by telephone when requested. Time signals sent by WWV and NSS were received daily, and the times of reception were exchanged with co-operating observatories. Five receivers located at the home of J. P. Henderson, 50 Perth St., Ottawa, each tuned to a station WWV, NSS, etc., connected to the Observatory by telephone line and operated by a selector switch, overcame the difficulty of receiving time signals at the Observatory itself due to induction interference from clock circuits and transmitters. Experiments on the problem of remote control of synchronous clocks were continued. The electro-comparator, designed and constructed at the Observatory for measuring very small changes in pressure, was utilized at the Poultry Division of the Experimental Farm for experimental work in connection with roosting damage to fowl.

The synchronized time service of some 750 electrically driven clocks in the various Government buildings in Ottawa was maintained. About 120 clocks, chronometers, watches and other timing mechanisms were cleaned, repaired, and rated for other branches of the Government service. Tables of sunrise and sunset, moonrise and moonset, phases of the moon, and eclipses, were supplied as in previous years, as well as a tabulation showing, for various places throughout the world, times corresponding to 12 noon Eastern Standard.

Terrestrial Magnetism.—Twelve repeat field stations were occupied in Ontario and Quebec. These were so situated relative to the agonic line as to provide evidence of a suspected westward shift. Twelve hundred and twenty-eight declination observations, made by officers of the technical services operated under the Surveys and Engineering Branch on map control field work, and officers of the Topographical Section of the Mines and Geology Branch, were computed and corrections for daily variation and disturbance applied. Valuable data relative to daily variation and disturbances in northern latitudes were obtained from these observations.

Field magnetometers, dip circles, and earth inductors were compared with the Ottawa B station standards. Fifteen compasses and compass attachments were standardized for other services.

A thorough investigation of the magnetic field in the compass test room of the Ontario Hughes Owens Company's factory was made for the Department of Munitions and Supply and the British Admiralty Technical Mission. The standard la Cour declinometer in use in the test room was recalibrated and three compass stands adjusted.

The magnetic observatories at Agincourt, Ontario, and Meanook, Alberta, continued to provide continuous photographic records of the magnetic elements. The recording variometers were recalibrated. Intercomparisons were made between the Dominion Observatory standard magnetic instruments and those of Agincourt and Meanook. Improved lamp installations for the Meanook Kew variometers were designed, constructed, and installed to provide secondary lights as an insurance against loss of trace during large disturbances. A 32-volt, 1,000-watt charging unit was installed at Meanook, and the standard clock was fitted with new minute and five-minute contacts. Preliminary computation of records was completed to the end of 1944 and preparation of the results for post-war publication proceeded. Tables of indices of geomagnetic activity were prepared and supplied each month to the Magnetic Section, International Union of Geodesy and Geophysics.

Investigational and research activities were guided by the necessity of providing precise data for war needs. Close co-operation continued with the Department of National Defence, the Department of Munitions and Supply, the Department of Terrestrial Magnetism of the Carnegie Institution of Washington, and the United States Coast and Geodetic Survey.

Seismology.—The teleseismic seismographs were maintained in continuous operation at Victoria, Saskatoon, Ottawa, Seven Falls, and Halifax, and in addition short-period instruments were operated at Ottawa, Shawinigan Falls, Seven Falls, and Kirkland Lake.

All Canadian registrations were regularly reported through the medium of a monthly bulletin. Reports on the records obtained at the two Quebec stations were prepared each month and distributed to the officials of the co-operating agencies.

During the year 460 earthquakes were recorded at stations of the Canadian network. All major shocks were reported to the press and to Science Service at Washington, D.C.

An earthquake on September 5, 1944, caused considerable damage in the vicinity of Cornwall, Ont., and Massena, N.Y. This earthquake was investigated in the field. A preliminary report was published in the Journal of the Royal Astronomical Society of Canada (January, 1945). The seismological records from all stations registering the earthquake have been obtained for further study.

A rockburst occurred in the Chateaugay Mine of the Republic Steel Corporation at Lyon Mountain, N.Y., on May 29, 1944. At the invitation of the District Manager, J. R. Linney, the seismologist visited the mine, obtained data with regard to the burst, and presented a confidential report to Mr. Linney and to the Department.

The rockburst studies at Lake Shore Mines have been continued without interruption. In addition to the widespread program begun on the east side of the mine in June, 1943, and continued to date, an intensive program was initiated, using 18 geophones in a single pillar. This was just coming into operation at the close of the fiscal year.

Gravity.—Gravimetric and magnetometric surveys were continued in collaboration with, and financed by, the Bureau of Geology and Topography at the request of the Department of Lands and Mines of the Province of New Brunswick. The surveys were for the purpose of tracing the presumed easterly continuation of a buried structure revealed in 1943 by the torsion balance between Sussex and Moncton, to outline the possible extent of the Weldon salt deposit by a network of gravity stations in that area, and to determine the location of presumed buried pre-Carboniferous ridges and intervening synclinal basins, possibly associated with the occurrence of oil, within the Carboniferous basin of New Brunswick. This basin occupies about one-half the area of New Brunswick and is situated in the low lying eastern and central parts of the Province.

Progress of the work was greatly accelerated during the past field season by the loan of a gravimeter from the American Geophysical Union, through the courtesy of the owners, the Humble Oil and Refining Company, of Houston, Texas.

The results obtained with this instrument were highly satisfactory. The apparent continuation of the Sussex-Moncton structure was traced for 20 miles to Barachois on Northumberland Strait. The Weldon salt deposit is indicated by a pattern of closed anomaly contours amounting to 3 milligals, corresponding to a possible thickness of a thousand feet of salt, although it is possible that part of the anomaly may be due to the occurrence of other lighter rocks. Results of several traverses across the Carboniferous basin reveal a series of gravity "highs" and "lows", striking in a general direction 30 degrees south of west and extending from Northumberland Strait and the Gulf of St. Lawrence into the interior of the province for distances up to one hundred miles. With certainty it can be stated only that the gravity anomalies correspond to anomalies of density in the underlying formations. It is apparent, however, that a considerable proportion of the anomalies could be accounted for by the existence of buried ridges, an assumption which, in view of the present knowledge, provides a plausible and likely explanation, although not necessarily the only one. For obtaining regional trends of gravity in adjoining areas, two gravimeter traverses were made across Nova Scotia and across Gaspé. One of the traverses between Port Elgin and Bathurst was also covered with a magnetometer. In all, 513 gravimeter stations were established in a period of two and one-half months. The time consumed in establishing such stations is thus almost negligible compared to that required for pendulum occupation, and the accuracy is excellent, provided the instrument can be standardized fairly frequently at previously established pendulum stations.

In addition to their value in the work described, the results of last season's observations form a valuable contribution to the solution of the more general theoretical problem, the determination of the form and nature of the earth's crust.

Solar Physics.—A hazy and cloudy condition persisted throughout the year, due possibly to the outpouring of ash from the Paracutin volcano in Mexico, despite the sunspot minimum, which is usually accompanied by transparency of the atmosphere.

Tabulations of the results of the 1913 solar rotation observations were completed and prepared on mimeographed forms for publication. Analysis of the 1914 solar rotation measurements was continued, giving convincing support to the pore theory of solar limb wave-length variation. During the progress of a sunspot cycle, the average latitude of sunspots exhibits a well-known equator-

ward drift of gradually lessening velocity. This velocity proves to be proportional to cos $^{0.315}$ ø.sinø, the rate of change of the linear velocity of the solar rotation, ø being the latitude. On the other hand, the apparent drift of faculae away from the equator is satisfactorily explained by motion upward from the solar surface maintained during one or two solar rotations. The usual records of visibility, cloudiness, and phenology were kept. Information concerning the sunspot cycle and its influences was supplied as requested.

Publications, Reports, and Bulletins.—Two numbers of the regular series of Publications of the Dominion Observatory were issued: Vol. XIII, Bibliography of Seismology, Nos. 14 and 15. Monthly reports on the magnetic character of the day in connection with international co-operative research on terrestrial magnetism were sent to the Department of Terrestrial Magnetism, Carnegie Institution, Washington, D.C., the acting agency for the International Association. The following bulletins, pamphlets, and brochures were distributed: Wireless Time Signals (monthly); Seismological Bulletin (monthly); Northeastern Seismological Bulletin (Nos. 122 to 125); The Rockburst Research at Lake Shore Mines (No. 12); Dominion Observatory Reprint No. 38, The Cornwall-Massena Earthquake, September 5, 1944. Numerous questions were as usual answered by special pamphlets and correspondence, relative to local, standard, and daylight saving time, time zones, sunspot cycle influences, and general astronomy and geophysics. Short articles, and popular notes, were written or edited for publication, including several for the "Sky Facts" column of *The Ottawa Citizen*. Revision of the Dominion Observatory star charts was continued for future publication and progressed favourably.

DOMINION ASTROPHYSICAL OBSERVATORY, VICTORIA, B.C.

Research work during the year was carried out with satisfactory results, although curtailed due to the absence of three members of the staff. The need for contributions to the war effort by the remaining staff members largely disappeared, with the exception of Dr. Beals' duties as Provincial Gas Officer in the Provincial Defence Organization of British Columbia. The seismographs continued in operation, and 65 earthquakes were recorded. Five new rain gauges were installed and maintained at various levels on Observatory hill for measuring precipitation in co-operation with the Meteorological Division of the Department of Transport. Records of rainfall were reported monthly. About 5,400 daytime visitors and many groups of service personnel from nearby camps and rehabilitation centres were given instruction on the work of the Observatory. Entertainment of the public on Saturday evenings remained suspended. S. S. Girling was appointed as Instrument Maker, Gr. 2, in April, 1944. Dr. McKellar continued on loan to the National Research Council for work with the Naval Services. In May, 1944, Dr. R. M. Petrie was released to the National Research Council for similar work. W. H. Stilwell was on loan to the Geodetic Service from May until October for work connected with the war, and was required to devote the major part of his time during the winter of 1944-45 preparing reports on his summer's field observations.

Instrumental Equipment.—Modifications were made in the ultra-violet spectograph by substituting two prisms of ultra-violet glass for the aluminum-on-glass grating. This arrangement of the instrument has the advantage of great speed as well as a reasonably flat field over the entire range of spectrum easily available to stellar spectroscopy. The instrument was used in its slitless form for work on colour temperatures, and with a slit for studying the ultra-violet spectra of Wolf-Rayet and other stars. The graphical intensitometer was modified in order to produce true spectral line profiles mechanically without the necessity of calculation. A surface plate of 24 inches by 36 inches was acquired for the Observatory work shop for use in erecting spectroscopic and

optical equipment. The two wind curtains covering the observing aperture of the dome were replaced. New thermostatic controls were installed in the seismograph vault, and in the small darkroom on the observing floor. The heating circuit of the stellar spectrograph was re-wired, following trouble on a number of occasions. A thermograph for the seismograph vault and a rolling-sphere planimeter were transferred to this institution from the Dominion Observatory at Ottawa.

Observations.—Various observing programs utilizing the spectroscopic equipment were carried out and satisfactory progress was made on a number of investigations. Observing conditions were somewhat below normal, particularly during the winter months; however, 1,542 spectrum plates were obtained in 911 hours on 162 nights.

Spectroscopic and Spectrophotometric Research.—Pleiades Cluster: A catalogue of 275 physical members of the cluster has been compiled, including magnitudes, proper motions, colour indices, spectral types, and binary characteristics; 405 spectra of 113 members of the cluster have been obtained to date. The proper motion of the cluster was determined from 43 General Catalogue stars and 50 tenth to seventeenth magnitude stars measured by Van Maanen. An apex of A, 57° 40′ and D, −27° 23′ was derived, with V_o=19·4 km./sec. The observed apparent motion is almost entirely due to the motion of the sun through space. The parallax was determined as π=0″·0136, corresponding to a distance of 74 parsecs. *Spectroscopic Binaries:* Preliminary elements were determined for the massive double-lined binary H.D. 191567, as well as for the star H.D. 35715. A period was determined for the binary H.D. 176853. *P Cygni Stars:* Progress was made in the preparation for publication of an extended paper on the P Cygni stars. The stars are being dealt with in the order of right ascension, and descriptions and assembling of data have been completed for 44 stars up to 20 hours right ascension. Five distinct types of emission line profiles have been recognized as characteristic of P Cygni stars, and it was found possible to interpret most of these types in terms of the motions and the degree of stratification of the stellar atmosphere. *Spectrophotometry of Solar-type Stars:* Intensities of 200 lines in the region λλ 3700-400 were determined from plates of α Canis Minoris, α Persei and γ Cygni which were taken with the Littrow spectrograph, using the grating in the third order. These lines include the strong ultra-violet lines of iron, and are being used to study curve of growth phenomena and conditions in the atmospheres of these stars. Additional solar line strengths were determined for comparison with theoretical intensities by means of the curve of growth. Although the scatter is greater than might be desired, the results indicate that both multiplet strengths and individual line intensities deviate from simple theory for the complicated atoms of iron and titanium. Laboratory measurements and comparison with prism spectra indicate that the total intensity of "ghost" lines in the grating used with the Littrow spectrograph amounts to approximately 5 per cent for the third order, and 2 per cent for the second order. The necessary steps were taken to apply suitable corrections in deriving line intensities obtained with this instrument. *Colour Temperatures of Wolf-Rayet Stars in Cygnus:* The relatively compact group of stars in Cygnus containing specimens of type O, B and W stars offers an exceptionally good opportunity for the determination of the colour temperatures of the Wolf-Rayet stars relative to the O's and B's. For a comparison of the relative gradients, the slitless form of the ultra-violet spectrograph with two prisms was used. Four hundred spectra were secured during the summer of 1944, and gradients of all Wolf-Rayet stars brighter than the tenth magnitude relative to nearby absorption-line objects were secured. Interstellar line intensities from slit spectra were used as criteria of distance, and results indicated a greater dispersion in distance than had been expected.

As a consequence, it was considered necessary to secure additional slit spectra of the B-type comparison stars before final conclusions on W star temperatures could be reached. Twenty of the necessary additional slit spectra were secured in the autumn of 1944, and it is expected to secure the remainder in the summer of 1945. *Stars in Taurus Cluster:* A study of 17 stars of the Taurus cluster was completed and prepared for publication. The stars selected were those which had been announced as binaries by various observers at the Yerkes Observatory and elsewhere. The diffuse line quality of the stars had cast doubt upon their binary character, and the present study was made for the purpose of further investigating this point. The results indicated that two of the seventeen were probably spectroscopic binaries, and in the case of others deviations from the mean velocity were attributed to the relatively large probable errors inherent in measures of early-type fuzzy-lined stars. The mean velocities of all stars were found to agree with the radial component of the cluster motion.

Publications, Addresses, and Relations with Scientific Societies.—Five articles were published in scientific journals, seven technical papers were presented before scientific societies, and eleven public addresses on astronomy were given by members of the staff. Preparation of manuscripts on the results of the various research programs was undertaken for future publication and progressed favourably.

DOMINION WATER AND POWER BUREAU

The outbreak of war in 1939 led to a rapid expansion in hydro-electric power development and within the first four years or so some 2,000,000 horse-power of new installation was installed to meet the requirements of war industry; this expansion culminated in 1943. During 1944 only one new installation of any considerable size was completed, namely, at Brilliant on the Kootenay River in British Columbia of 68,000 horse-power, which development accounted for almost the entire increase in installation. The production of electricity also showed that war industries had about reached their peak, because 1944 production of energy was very slightly less than that for 1943.

Since the gradual conversion to peace economy will leave an excess of power production capacity to be absorbed, no large projects are now either under construction or under consideration for immediate development.

Post-war activities will, it is anticipated, provide for agricultural settlement with the attendant problems of water supply for irrigation, drainage, etc.; intensified mineral prospecting with the need of convenient hydraulic power for mining, smelting, refining, and fabrication, and the general pushing out from the frontiers of settlement will raise further questions of water supply. With these requirements in prospect the Bureau has steadily expanded its hydrometric investigation and has taken advantage of new transportation facilities, such as those provided by the Alaska Highway, to obtain records of rivers which were formerly inaccessible. During the fiscal year almost 50 new stations were established, bringing the total throughout Canada to 766, whilst 2,560 individual flow measurements were made, an increase of about 25 per cent over the previous year.

WATER AND POWER

Lake of the Woods Regulation.—During the year the run-off throughout the Lake of the Woods watershed was well above normal and reached flood proportions in the months of June, July, August, and September. Above normal run-off continued throughout the winter months. Lake level rose from elevation 1,059·58 on April 1, 1944, to elevation 1,061·0 on June 6, at which point the regulation became subject to the approval of the International Lake of the Woods Control Board. The control facilities were so operated that lake level crested at elevation

1,061·59 on June 23 and was brought down to elevation 1,061·30 on July 31. Unusual precipitation early in August resulted in lake level rising to a maximum elevation for the year of 1,061·84 on August 16, after which it was brought down to elevation 1,061·25 on September 19. Lake level was held close to the upper storage limit until December 18, when it was drawn below elevation 1,061·0 and the regulation again became the full responsibility of the Canadian Lake of the Woods Control Board. The outflow was regulated at above normal rates throughout the remainder of the fiscal year and lake level was drawn to elevation 1,060·21 on March 17 after which, owing to an early breakup, the run-off again reached flood proportions and lake level rose to elevation 1,060·88 on March 31, 1945.

Lac Seul Regulation.—The actual regulation of Lac Seul continued to be carried on by the Hydro-Electric Power Commission of Ontario acting in co-operation with the Lake of the Woods Control Board. The run-off during the year was above normal but did not reach flood proportions. Lake level rose from elevation 1,167·20 on April 1, 1944, to elevation 1,171·41 on September 6 and was drawn down to elevation 1,167·67 on March 25, after which with the early break-up it rose to elevation 1,167·77 on March 31, 1945.

Snow Survey.—The seventeenth annual snow survey in the Lake of the Woods and Lac Seul watersheds was carried out during the first week of March in co-operation with the United States Engineer Office at Duluth, Minnesota, and the Hydro-Electric Power Commission of Ontario. The results show that the water content of the snow on the ground at the time of the survey was slightly above the average for the 17-year period.

Water Power Administration

No change was made in the power development on the Yellowknife River in the Northwest Territories operated by the Consolidated Mining and Smelting Company of Canada Limited, and the present installed capacity of 4,700 horsepower has been found adequate to utilize the average yearly river flow augmented by existing storage. The output of the plant for the calendar year 1944 amounted to 16,356,400 kw. hrs. of electricity compared with 20,073,500 in the previous year; the decrease being due to further limitations in the mines served by this development.

Work in connection with the combined storage and power development in the Lake Minnewanka area of Banff National Park, constructed by the Calgary Power Company Limited to provide additional power urgently needed for war industries in southern Alberta, as described in previous annual reports, comprised improving the diversion works from the Upper Ghost River, providing a new camping site with water supply and other requirements, and additional clearing of the lake shores in winter when ice cover provided a means of travel. Lake Minnewanka reached its lowest level on May 5, 1944, at elevation 4,804·98 and the highest level was 4,831·98 on October 24, 1944. The usable storage at that time was 134,500 acre-feet as compared with a maximum of 175,500 acre-feet in the previous year, and on March 31, 1945, the usable storage was 18,667 acre-feet.

The Lake Minnewanka development is operated so that the power available from the stored water is delivered into the southern Alberta power system during that part of the year when the power load is highest and the natural flow of the Bow River is diminished by winter conditions. Thus during the year under review the power plant was operated almost at its full capacity from the latter part of October to the end of March. During the summer months when storage was built up, the power plant was used only occasionally for short periods. The run-off in southern Alberta during those months was somewhat below normal and the power output of the Cascade plant of the Minnewanka development for

the year 1944 was less than in the previous year, as was the case also with the output of the Calgary Power Company's developments on the Bow River. A comparison of the corresponding outputs is as follows:—

Calendar Years	Cascade	Kananaskis	Horseshoe	Ghost
1943.....kw. hrs.	63,459,080	67,960,000	77,586,500	132,728,600
1944.....kw. hrs.	53,351,070	66,308,300	77,216,900	128,898,300

Technical Assistance to Indian Affairs Branch

In furtherance of applications filed under the British Columbia Water Act for the right to use water on Indian reserves in the Province, five conditional water licences were obtained, three for irrigation purposes in the Lytton, Okanagan, and Stikine Agencies and two for domestic purposes in Cowichan and Stikine Agencies. Two final licences for irrigation purposes were issued in the Okanagan Agency. To protect Indian interests and secure additional supplies of water for Indian reserves, various conferences were held with the Indian Commissioner for the Province and the Provincial Comptroller of Water Rights. For the same purpose, hearings of the Water Board were attended, surveys made, evidence prepared, and objections filed against applications which if granted were considered likely to affect Indian water rights. Several new applications for water rights were also prepared and are now before the Comptroller.

The Water-Power Resources of Canada

Canada's water-power resources are estimated at 25,439,400 h.p. under conditions of ordinary minimum flow and 39,511,700 h.p. ordinarily available for six months of the year, providing for a commercial installation of some 51,350,000 h.p. During 1944 the wartime expansion in hydro-electric facilities was virtually completed; the net increase in installation being only 69,250 h.p. Canada's total water-power development at January 1, 1945, was 10,283,763 h.p., representing approximately 20 per cent of the possible development.

Census of the Central Electric Station Industry

More than 90 per cent of Canada's total water-power installation is in central electric stations and these produce 97¼ per cent of all electricity sold for use in Canada or for export. Hydro-electricity produced during 1944 totalled 39,479,363,000 kilowatt hours, which was only slightly less than the record production of 1943.

DOMINION HYDROMETRIC SERVICE

The Dominion Water and Power Bureau carries on the work of securing and compiling stream measurement records throughout Canada under co-operative arrangements with the various provinces.

Run-Off Conditions in Canada.—The run-off for the year was variable throughout Canada and on the average slightly below normal. Above normal run-off was recorded on typical streams in north-central British Columbia, northern Alberta, eastern Manitoba, northwestern Ontario, southern New Brunswick, and eastern Nova Scotia. No new minimum or maximum rate of run-off was recorded.

In the Pacific drainage, typical stations showed a range in run-off from 73 per cent of the long term mean in the Kootenay River at Wardner, to 111 per cent of the long term mean in the North Thompson River in north-central British Columbia. In the Arctic and Western Hudson Bay drainage, typical stations showed a range in run-off from 71 per cent of the long term mean in the Assiniboine River at Headingly, Manitoba, to 215 per cent of the long term mean

in the Red River at Emerson, Manitoba. In the St. Lawrence and Southern Hudson Bay drainage, typical stations showed a range in run-off from 70 per cent of the long term mean in the Moira River at Foxboro in eastern Ontario to 98 per cent of the long term mean in the St. Francois River in southern Quebec. In the Atlantic drainage, typical stations showed a range in run-off from 77 per cent of the long term mean in the St. John River at Pokiok in northern New Brunswick to 116 per cent of the long term mean in the St. Mary River at Stillwater in eastern Nova Scotia.

Power and Special Investigations

Special investigations during the year in British Columbia were undertaken chiefly in connection with problems arising on streams crossing the International Boundary. Important hydraulic investigations were continued with respect to the effect of the regulation of Kootenay Lake in the interest of power development upon reclaimed bottomlands in the Kootenay Flats area of British Columbia and Idaho; backwater effects on the Columbia and Pend d'Oreille Rivers in Canada from the operation of the Grand Coulee development in the State of Washington, and similar effects, existing or in prospect, on Okanagan and Skagit Rivers from works or obstructions in United States territory; and the supply of water from Phillips Creek for irrigation purposes in British Columbia and Montana. In connection with the Columbia River Reference now before the International Joint Commission, field investigations that will take several years to complete were begun by the Bureau in the Canadian part of the basin in accordance with a program planned by the International Columbia River Engineering Board appointed by the Commission. Hydraulic investigations were continued for a Dominion-Provincial Joint Board of Engineers in connection with flood control studies on Okanagan Lake and River. Other engineering studies were undertaken for various Federal Departments and for other branches of this Department, including hydrometric data on Vancouver Island streams for the Pacific Biological Station; irrigation problems of the Department of Agriculture at Kamloops; a major hydraulic problem of the Department of Public Works involving the development and maintenance of permanent ship channels in the Fraser River from Fraser Mills to the sea, and administrative problems of the Lands, Parks and Forests Branch of this Department on various reserves and properties, including the construction of monuments for the Historic Sites and Monuments Board.

In the Northwest Territories the Bureau participated with the Calgary Power Company in a reconnaissance of the power possibilities of the Lockhart River.

In Alberta and southwestern Saskatchewan extensive studies were again undertaken in the Milk and St. Mary River basins for the purpose of determining the natural flow of the St. Mary and Frenchman Rivers at the point where each river crosses the International Boundary. The Twenty-third Annual International Snow Survey on the Upper St. Mary River in Glacier National Park, Montana, was conducted on May 4 and 5, 1944, in co-operation with the United States Geological Survey; and on March 26, 27, and 28, 1945, the Ninth Annual Bow River Snow Survey was made in the vicinity of Lake Louise, Alberta. A further study was made of ice conditions on the Bow River in the vicinity of Calgary and in co-operation with the Calgary Power Company studies were continued of water storage and power possibilities on the upper reaches of the Bow River and its tributaries.

In southeastern Saskatchewan and Manitoba excessive run-off was experienced throughout the Souris River watershed during the summer, and special studies of flow were made in connection with the Reference now before the International Joint Commission concerning the apportionment of the water supply of the watershed.

In Ontario special investigations in co-operation with the Hydro-Electric Power Commission of Ontario were continued of the discharge in the channels diverting water from the Ogoki River and Long Lake towards Lake Superior. Snow surveys were again made for the Commission during February and March, 1945, in the watersheds of the Wanapitei, Sturgeon, South, Muskoka, and Madawaska Rivers. Special hydraulic studies were continued in the Niagara River above the falls to determine the effect upon water levels, in the river and at various power intakes, of the construction of a submerged weir jointly undertaken by the Governments of Canada and the United States for improving war-time power production from power plants on both sides of the river and also scenic conditions at the falls. Investigations of hydraulic conditions on the South Nation River were repeated for the Department of Public Works during the freshet of March, 1945, and special attention was given during the same month to the Thames River in connection with the flood problem on that river.

In Quebec the securing of special hydraulic data was continued on the Richelieu and Magog Rivers in connection with international problems and co-operation was afforded various power organizations in checking power station ratings.

In New Brunswick an inspection was made of the international reach of the St. Croix River and a report was prepared for the International St. Croix River Board of Control covering conditions in 1944. An inspection was made in November, 1944, of the Petitcodiac Tidal Power Project under investigation for the Governments of the Dominion and of New Brunswick by H. G. Acres and Company, Consulting Engineers, Niagara Falls, Ontario, and in October observations of tidal flow velocities were obtained at the site.

In Nova Scotia a memorandum on the power resources of Nova Scotia was prepared for the Royal Commission on Provincial Development and Rehabilitation. Special studies were made for the design of a pipeline and reservoir on the St. Croix River and a small power-site was investigated in Hants County.

In September, 1944, at the request of the Newfoundland Government, transmitted through the Department of External Affairs, a visit by the District Chief Engineer of the Bureau at Halifax was made to St. John's, Newfoundland, and conditions were reviewed in connection with a proposed program of power investigatory work in that country.

INTERNATIONAL WATERWAY MATTERS

Reference has been made in the preceding paragraphs to some of the work of an international character performed by the Bureau during the year. In addition, the collection of hydrometric records in connection with numerous other international problems has been continued.

Special mention should be made of the extensive studies undertaken for the International Joint Commission in the Columbia River basin; the Bureau has been actively engaged in the preparatory work looking to the solution of the water problems of domestic water supply and sanitation, navigation, water power, flood control, irrigation, reclamation of wet lands, conservation of fish and wildlife, and other beneficial purposes, involved in the studies of the International Columbia River Engineering Board of which the Controller is a member for Canada.

The collection of hydrometric records in connection with the international problem of the Roseau River and its tributaries was continued.

The International Rainy Lake Board of Control of which an engineer of the Bureau is the Canadian Member carried out an inspection of conditions at the outlets of Rainy and Namakan Lakes and submitted a Preliminary Report to the International Joint Commission.

An engineer of the Bureau continued as a member of the Engineering Sub-committee charged with the responsibility of designing and supervising the construction of the submerged weir in the Niagara River above the falls, jointly undertaken by the Governments of Canada and the United States.

The International Boards of Control which functioned during the year were those relating to Columbia River, Kootenay Lake, St. Mary and Milk Rivers, Souris River, Rainy Lake, Lake of the Woods, Prairie Portage, Lake Superior, Niagara, Massena, Lake Champlain, and St. Croix River.

REVENUE

During the year sums aggregating $33,068 were received from the various provinces in support of the co-operative resources studies; $97,706.52 was received from the Province of Manitoba in connection with the capital and operating costs of the Lake of the Woods and Lac Seul storages as provided by the Natural Resources Transfer Agreement and $12,403.64 was the amount of revenue obtained from water-power licences; sale of publications and refunds of previous years expenditures increased the total revenue to $143,429.39. During the year the sum of $3,500 additional was received in connection with a water-power development in the Bow River on behalf of, and was remitted to, the Indian Affairs Branch.

PUBLICATIONS

During the year Water Resources Paper No. 85, Surface Water Supply of St. Lawrence and Southern Hudson Bay Drainage in Ontario and Quebec from October 1, 1937, to September 30, 1939; Water Resources Paper No. 87, Atlantic Drainage (South of St. Lawrence River) in New Brunswick, Nova Scotia, and Prince Edward Island from October 1, 1938, to September 30, 1940; and Water Resources Paper No. 90, Pacific Drainage in British Columbia and Yukon Territory from October 1, 1938, to September 30, 1940, were published. The annual mimeographed bulletins on "Hydro-Electric Progress in Canada" and "Water Power Resources of Canada" were issued as usual.

ENGINEERING AND CONSTRUCTION SERVICE

The Engineering and Construction Service continued its functions as a general engineering agency of the Department, and also undertook engineering work for other Departments of the Government or acted in an advisory capacity as called upon. The work included the organization and supervision of construction and maintenance operations for the larger projects, as well as preparation of plans, estimates, specifications, and designs for such activities. In case of numerous small projects, inspections were made, supervision exercised and reports and technical advice supplied as might be required by various Government services. During the year under review, work of major importance was undertaken for the Department of National Defence (Army).

In connection with war-time activities, technical officers have been lent for temporary work, and others seconded for required periods or for the duration.

In order to make provision for post-war emergency employment on worthwhile projects which will contribute to the natural development and welfare of the country, survey parties were organized to obtain information on the improvement and reconstruction of existing highways, water supply and sewage systems, and on highway bridge sites in Canada's National Parks. A summary of the work done in this connection is given later in this report.

With the approval of the War Committee of the Cabinet, an engineer of the Engineering and Construction Service was stationed on the Alaska Highway early in 1944 to observe and report on all phases of reconstruction and main-

tenance work carried on by the United States authorities during 1944-45. The data so obtained will be of great value to the Canadian authorities in estimating the extent of Canada's responsibilities in maintaining the highway after the war. In June, 1944, a second engineer was also stationed on the highway. After that date observation work on the Canadian section of the highway was divided between the two Engineers.

Construction of the highway between Prince Rupert, B.C., and Kitwanga, B.C., began in 1942 as a war measure for the Department of National Defence, was carried to completion. Construction operations were continued over seven contract sections as two of the original nine contracts had been completed the previous year. A twenty-foot gravel surfaced road was provided for. All bridges are of timber in view of war-time restrictions on the use of steel for such purposes. Truss bridges were constructed of treated timber and in accordance with standard plans of the Province of British Columbia. A summary of work done on this project is given farther on in this report.

Major items of work undertaken under the supervision of the Engineering and Construction Service during the period under review are given as follows:—

HIGHWAYS

Prince Rupert-Terrace-Cedarvale-Kitwanga Highway

Work on seven of nine contract sections of this military project was completed during the period, contract for Sections 5 and 6 having been completed during 1943-44. Sections 4 and 9 were finished in May, 1944; Sections 7 and 8 in June; Section 3 in July; Section 2 in August; and Section 1 in November.

The following quantities of major items of work were done during the period: cutting and clearing, 10·240 acres; stumping and grubbing, 7·833 acres; excavation, all materials, 372,425 cubic yards; round logs in cribs and culverts, 6,899 linear feet; hewn logs in cribs and culverts, 11,220 linear feet; iron and steel in common bridges, cribs and culverts, 26,587 pounds; sawn timber in common bridges, cribs and culverts, 158,564 feet board measure; piling cut-off in place, 2,260 linear feet; rip-rap, 23,047 cubic yards; gravel and crushed rock surfacing, 71,696 cubic yards; truss bridges erected, 1.

Crews were employed on completed sections on a day labour basis to maintain the road surface, bridges, drainage structures, remove mud slides, clean ditches, repair washouts, and to carry out other general road maintenance works.

ENGINEERING WORK FOR INDIAN AFFAIRS BRANCH

British Columbia

Vancouver Agency.—A domestic water supply line from the Union Estates main pipeline was completed on Sechelt I.R. No. 2 and necessary fire-fighting equipment installed. Following an inspection a report was prepared on the possibilities of furnishing a domestic water supply system on Nanoose I.R. No. 2 from local springs. Work was started on the project late in the period. An extension was made to the domestic water supply system on Musqueam I.R. No. 2 to provide some further services.

New Westminster Agency.—Inspections and reports were prepared covering domestic water supply systems on Pemberton I.R. No. 1 and Matsqui I.R. No. 2 and on the reclamation work carried out on Pemberton I.R's. Nos. 1 and 8 by the Pemberton Reclamation Committee in Lillooet River Valley. The old bridge over the Hope Slough on Skwah I.R. No. 3 was dismantled and a new bridge erected. A new heating plant was installed at the Coqualeetza Indian Hospital, Sardis. The refrigeration plant was moved to a new location to provide for the extension of the heating plant.

West Coast Agency.—New flashings to copings and repairs to existing parapet flashings were carried out at Alberni Indian Residential School. Repairs were also made to the wooden roof deck and ventilators installed. An investigation and survey for a water supply system on Sheshaht I.R. No. 1 was carried out and a report prepared.

Nicola Agency.—Inspections were made to the irrigation system on Lower Nicola I.R. No. 9 with respect to an application for diversion of water on Shackelly Creek, and to the Mamit Lake Dam, on Lower Nicola I.R. No. 1. A discussion was held with the Indian Agent *re* proposed irrigation improvements on Douglas Lake I.R. No. 3 and repairs to the flume of the irrigation system on Lower Nicola I.R. No. 11 were completed.

Kootenay Agency.—Investigations and reports were made in connection with the water softening plant at St. George's Residential School and on improvements to plumbing at Kootenay Residential School, Cranbrook.

Kamloops Agency.—Additional work on Upper Paul Creek irrigation system on Kamloops I.R. No. 1 was staked out, and fluming material collected. An inspection was made of damage to the pumping plant by floodwaters and report prepared covering necessary repairs.

Lytton Agency.—A pipeline was installed from Tyee Jummy Creek for use on Lillooet I.R. No. 1. An inspection was made and report prepared on replacing some of the existing irrigation works from Siska Creek on Siska I.R.'s. Nos. 3 and 8. Work in this connection started late in the period.

Bella Coola Agency.—Inspections and reports were made of water supply systems on Bella Coola I.R. No. 1 and Bella Bella and Kitasoo (Klemtu) Indian Villages. Possibility of power development was also covered at Kitasoo.

Nass-Skeena Agency.—Inspections and reports were made of water supply systems in Port Simpson and Kitkatla Indian Villages and on Kulkayu I.R. No. 4 and Greenville I.R. No. 9. Power possibilities on the two reserves were also investigated.

Okanagan Agency.—Arrangements were made for the supply of pipe for improvements to the existing irrigation system on Osoyoos I.R. No. 1 from Inkaneep Creek.

Northwest Territories

Fort Norman Agency.—Tracings were made of plan of Fort Norman Hospital.

Alberta

Stoney Agency.—The office and warehouse buildings at this agency were inspected and a report prepared with estimate of cost for the erection of new buildings.

Edmonton Agency.—An inspection was made and a report prepared covering repairs to roof and cornice of the Indian Residential School.

Hobbema Indian Agency.—An inspection of the sewage disposal system for the Indian Agent's residence, farm instructor's residence, clerk's and nurse's residence was carried out and a report prepared with an estimate of cost relative to proposed improvements. An inspection and report was made covering a water supply system for Sarcee I.R. Hospital.

Saskatchewan

Onion Lake Agency.—An inspection and report was made on the proposed water supply to serve this agency. An inspection and report was made of the salvaged metal at the Indian Residential School.

Duck Lake Agency.—An estimate was prepared for the construction of a new barn on John Smith Reserve. An inspection and survey was made and a report prepared relative to hydro-electric development at Beauval Indian Residential School, La Plonge River.

Touchwood Agency.—An investigation was carried out and a report prepared on the water supply serving Gordon's Indian Residential School, Punnichy.

Manitoba

Portage la Prairie Agency.—An inspection of the electric power plant and heating system at Sandy Bay Indian Residential School was made and repairs to the school roof completed. An inspection of the roof of Elkhorn Indian Residential School was made and a report prepared on the repairs required.

Norway House Agency.—An inspection was made and a report prepared on the diesel electric power plant serving this agency. Preliminary estimates of the cost of the proposed barracks for R.C.M.P. were prepared.

Ontario

Kenora Agency.—An inspection was made of Cecilia Jeffrey Indian Residential School and a report prepared on the repairs required to the heating system.

Six Nations Superintendency.—An inspection was made of the R.C.M.P. Barracks at Ohsweken and plans and specifications were prepared for a new structure.

Quebec

The installation of a domestic water supply pipeline from the reservoir to serve the Huron Village of Lorette was completed.

St. Regis Agency.—An inspection and a report was made on the sewage disposal system to serve existing and future buildings at this agency. An inspection was carried out in connection with suggested repairs and alterations to the Agent's residence and medical quarters.

Caughnawaga Agency.—An inspection was made relative to suggested sites for a new senior school. Discussions took place regarding the possible re-modelling of existing day school to provide adequate accommodation, also requirements for teacher's residence. A new boiler was installed and renovations to the heating system carried out at Kateri Indian School.

Maritime Provinces

Shubenacadie Agency, Nova Scotia.—Erection of a new day school was undertaken by contract, approximately one-half of the work being completed at the end of the period. Specifications were prepared and a well drilled with a view to obtaining a domestic water supply to serve these agency buildings. An estimate of the cost of waterproofing the Indian Residential School buildings was prepared, and tenders asked on this work.

Eskasoni Agency, Cape Breton.—Working drawings and specifications and tendering documents were prepared for day school, teacher's residence and agent's residence.

Lennox Island Agency, Prince Edward Island.—Plans and specifications and tendering documents were prepared for Indian Agent's Residence.

General

Working drawings were prepared of typical one- and two-classroom day schools, with and without teacher's living accommodation, and for a two-ward nursing station with nurses' living accommodation.

JAPANESE WORK PROJECTS

During the period Japanese workers were employed on four projects as follows:—

Yellowhead-Blue River Project.—Three camps were operated north of Blue River for the summer months. During winter operations, these camps were reduced to two. A small field hospital was operated at Blue River. Work was carried out north from Blue River and included opening up tote road, widening and repairing permanent road, cutting and clearing, installing culverts, draining and ditching, and placing corduroy. Permanent bridges were constructed over the North Thompson River, Thunder River, and Mileage Creek. Temporary bridges were erected over Gravel and Whitewater Creeks. The number of Japanese in camps at the end of the period was 84.

Hope-Princeton Project.—During the year 1942-43 a rough tote road was opened up between Hope and Princeton in case military trucks should have to go through. This year work operations were concentrated for the most part on building a road to standard width working from camps at both ends. Other work carried out included excavation on tote road, clearing right of way, culvert construction, and maintenance of graded sections. Under the policy being followed many Japanese transferred to lumber companies and to industrial and farming centres and thus reduced the number of Japanese on this project from 250 to 118.

Revelstoke-Sicamous Project.—Work operations on this project were conducted along the section of the Trans-Canada Highway between Revelstoke and Sicamous in British Columbia. Three camps were operated to July 3 when men were transferred to private industries and the project closed down. Work consisted of widening and straightening the highway and constructing revisions.

Schreiber-Jackfish Project.—One camp was operated on this section of the Trans-Canada Highway for a period of two months as owing to the demands for the transfer of Japanese to private industry the policy was adopted of closing out the project. Men at this camp were employed chiefly on fuel-wood cutting and road maintenance.

ENGINEERING WORKS FOR NATIONAL PARKS BUREAU

Banff National Park

Lake Minnewanka Development.—An engineer continued to act as departmental representative in connection with the development of Lake Minnewanka by the Calgary Power Company.

Buildings.—Sketch plans were prepared for a proposed chalet type concession building on Tunnel Mountain and for a proposed new fire hall for Banff.

Highways.—A location survey was carried out for a new road to be used as one-way traffic in conjunction with the existing Trans-Canada Highway from the East Entrance Gateway of Banff Park to join with the Trans-Canada Highway approximately one and one-half miles northwest of Banff. From this junction a survey was made of the Trans-Canada Highway to the west boundary of Banff Park with the object of widening and relocation of a four-lane, three-lane or boulevard type of highway. Arrangements were made to secure information on the volume and type of traffic in the park highway system in connection with the proposed construction of three- and four-lane highway systems. A survey was made of the Moraine Lake Road with the object of improving alignment and widening.

Bridges.—Site surveys were made for the following proposed bridges:—Baker Creek, Little Vermilion River, Spray River, Bow River, Boom Creek, and

two bridges over Louise Creek. Bridge plans were prepared for the proposed Baker Creek, Bow River, and Spray River bridges. Borings were obtained at the site of the Spray River Bridge.

Townsite Services.—A plan, profile, and estimate of cost was prepared of the proposed water supply and sewer service to serve Mountain and Kootenay Avenues in Banff townsite. A survey of the site, including test borings, was made and plans prepared of the proposed new dam on Forty Mile Creek and replacement of a ten-inch auxiliary pipeline relative to the Banff water supply. Flow measurements at the intake were taken and tabulated.

Kootenay National Park

Sinclair Creek Bridge, Mile 3·1.—A steel and concrete girder bridge with concrete parapets was erected over Sinclair Creek at Mile 3·1 on the Banff-Windermere Highway.

Hydro-electric Development.—An investigation was made and a report prepared on the proposed hydro-electric development at Radium Hot Springs.

Highways.—With the object of widening and improving alignment and grades a final location line was run over the Banff-Windermere Highway from Castle Mountain on the Trans-Canada Highway in Banff Park to the east boundary of Kootenay Park, thence following the existing highway in Kootenay Park to the west boundary of that park.

Jasper National Park

Jasper Townsite.—Sketch drawings were prepared for a proposed residence on Lot (33) Block 15.

Highways.—A detailed inspection was made of the washout at Mile 22·05 on the main Jasper-Edmonton Highway and a report prepared giving an estimate of the cost of placing the highway in good condition. In view of the numerous slides and failing cribs an inspection of the Miette Hot Springs Road was carried out and report prepared including an estimate of the cost of placing the road in good condition. Commencing at Jasper Townsite 30½ miles of the Banff-Jasper Highway were surveyed with the object of widening, making revisions, and hard surfacing. A resurvey was made of the Jasper-Yellowhead Highway relative to alignment and improvement.

Bridges.—The survey was made of a site for the construction of a bridge over the Athabaska River on the Jasper-East Highway.

Yoho National Park

Highways.—A traverse survey with the object of widening and relocation was made of the Trans-Canada Highway from the British Columbia-Alberta boundary to the west boundary of the park. Preliminary surveys were carried out along the abandoned railway right of way from Field to the Ottertail River, from Leanchoil to Wapta Falls, and from Hector to O'Hara Lakes (2½ miles completed). A survey was made for a high-level crossing over the Canadian Pacific Railway tracks in the vicinity of Field.

Prince Albert National Park

Highways.—A retracement and revision survey was carried out of the Waskesiu Highway from a point on the east boundary of the park to Waskesiu. A location survey was made from the end of construction of Heart Lakes Road to the First Narrows, Waskesiu Lake.

Townsite Services.—A topographic survey was made and data collected relative to the proposed sewer project for Waskesiu Townsite.

Riding Mountain National Park

Highways.—A new road was located west from the Clear Lake-Dauphin Road to join up with the road from Clear Lake to Audy Lake. A new road was also located from a point approximately seven miles east of Wasagaming on the Norgate Road to Whirlpool Lake and Dauphin Road.

Wasagaming Townsite.—A sketch was prepared for proposed cottages on Lots 5 and 9, Block 11. Sketch plans on proposed alterations to summer hotel, Lot 3, Block 23 were examined. Plans and specifications were prepared for a proposed R.C.M.P. barracks. An investigation was made of the present sewage system of the townsite. A topographic survey of the townsite and a survey for the new sewage disposal field were completed.

Cape Breton Highlands National Park

Highways.—With the object of improvement and reconstruction, a survey was made of the Cabot Trail from the tower on North Mountain to the park boundary at Pleasant Bay. A location survey of a proposed road from Ingonish to Neil Harbour was carried out. Surveys were made of alternative routes from the park boundary at Mile 7·2 to the pond at Warren Brook, and connecting with proposed road from Warren Brook to Neil Harbour.

Bridges.—Bridge site surveys were carried out at the following points: Mile 34·5, South Aspy Bridge; Mile 34·9, North Aspy Bridge; Mile 35·0, Two Bent Trestle; Mile 35·9, Nine Bent Trestle; Mile 37·4, Six Bent Trestle; Mile 37·9, Seven Bent Trestle; Mile 38·1, Five Bent Trestle; MacKenzie River, Cheticamp River, Clyburn Creek, Warren Brook, Black Brook, and Still Brook.

Buildings.—Plans, specifications, and tendering data were prepared for a proposed R.C.M.P. barracks. A topographical survey was carried out of the proposed site.

Prince Edward Island National Park

Highways.—A location survey for a new highway was made between North Rustico and New London Bay.

Elk Island National Park

Buildings.—Prepared sketch plan of staff quarters.

Fort Beausejour National Historic Park

Buildings.—A bill of materials for a proposed warehouse was prepared.

General

Timber Lookout Towers.—Prepared sketch for revision to cabin floor framing.

Youth Hostels.—Prepared prefabrication drawings for sectional building.

Northwest Territories

Physician's Residence, Fort Smith.—Plans, specifications, and tendering data were prepared for a proposed physician's residence at Fort Smith, N.W.T.

GEODETIC SERVICE OF CANADA

During the fiscal year the Geodetic Service of Canada carried on its basic operations providing horizontal and vertical control for surveys and mapping; as in the previous year, these were mainly associated with war activities and post-war planning. In several cases these operations were extensions of basic work carried out in previous years. It has been borne out very strongly that the vigorous prosecution of these fundamental operations in selected parts of the country pays large dividends in subsequent years. If these operations

are delayed until the immediate need arises it frequently happens that they are too late; this is because it often takes several years' work for accurate horizontal and vertical control to be carried into any particular area. The requirements need to be foreseen by several years so that work can be projected to strategic areas to be readily available when and where required.

The above conditions do not apply to astronomical determinations used for the control of aerial photographic small-scale mapping. These observations do not require a continuous program distributed over a period of years; they can be laid down when and where required, a great advantage. Were they not subject to certain errors which cannot be entirely eliminated, astronomical observations would be ideal for accurate horizontal control.

Details of operations carried on during 1944-1945 follow:—

TRIANGULATION

Gulf of St. Lawrence.—During 1944 triangulation along the north shore of the Gulf of St. Lawrence was completed on a 70-mile gap west of the southwest approach of the Strait of Belle Isle. The completion of this triangulation provided a junction with the Newfoundland net reported on below. The junction of these two nets completes a 1,300-mile triangulation circuit of the Gulf of St. Lawrence which will permit final data to be calculated for all of this loop as well as a number of subsidiary nets. The triangulation in this area was in charge of J. W. Menzies with angle measurement parties in charge of K. H. Ewing and A. Trottier.

Newfoundland.—The completion of the Newfoundland triangulation in 1944 to a junction with the Canadian nets reported on above at the southwest approach to the Strait of Belle Isle, thence along the Strait to its northeasterly end at Belle Island was an operation the completion of which, after ten years of effort, was welcomed. All of the Newfoundland work was a co-operative effort in which Canada supplied the technical officers and instruments and will publish the mathematical data, while Newfoundland paid all field expenses. The work was in charge of W. M. Dennis with angle measurement parties in charge of J. H. Kihl and G. D. Hueston.

The area in the eastern Gulf of St. Lawrence and in Newfoundland reported on above was one of fog, rain, and generally unfavourable weather for triangulation, with treacherous seas and inadequate harbours. It is with satisfaction that the successful completion of these two important links of geodetic work is reported.

St. Augustine River.—Angular measurements in charge of Professor L. J. Arcand were practically completed on the secondary triangulation net up the St. Augustine River from its mouth to a point near the Quebec-Labrador boundary about 100 miles north. As the river was a very difficult one for canoe work all parties, together with equipment, canoes, and food for three months, were flown to the northerly end, and the party worked downstream. A baseline and Laplace station were selected near the northerly end of the net, and the parties were flown in with the triangulation parties; they were flown out about two weeks later when their particular work was completed.

Natashquan River.—The secondary net northward along the Natashquan River from its mouth towards the Labrador-Quebec boundary was continued during the season by three parties—reconnaissance, station preparation, and angle measurement, in charge of N. E. Keny, P. Hounsell, and Professor W. F. Riddell, respectively. Reconnaissance and station preparation reached a point about 100 miles north of the river-mouth and angle measurements about 60 miles. Caches of food and gasoline were flown in to points 50 and 100 miles north and were distributed by canoe as required.

Moisie River.—In anticipation of operations during 1945 adjacent to the Moisie River north of Seven Islands, Quebec, an aerial reconnaissance was made of the area during 1944. As the Moisie River was found to be too rough for normal canoe operations, and as the country is exceedingly rough, it was decided that a short-line net close to the river was impracticable, and a long-line net of fifteen stations was laid out by plane which, with aeroplane transportation, will carry the net about 120 miles northerly to latitude 52° on Lake Coapacho, from which point easy canoe transportation is available for 250 miles farther north roughly adjacent to the Labrador-Quebec boundary.

Hamilton, Ontario.—At the request of the Department of Public Works an intensive triangulation system of 20 stations was laid out on the shores of Burlington Bay, the stations marked and observed during the season to act as a basis for projected surveys by the Department of a new harbour line which is required as a prelude to post-war construction operations.

Scarborough, Ontario.—In the spring and autumn of 1944 a considerable extension of the secondary triangulation in the area between Scarborough and Port Hope was completed for, and at the expense of, Research Enterprises Limited, on which developments in radar equipment may be tested as to their improved accuracy.

Yukon Territory.—A preliminary aerial reconnaissance was made during 1944 along the Alaska Highway easterly from Whitehorse, along the Canol Road from Johnsons Crossing as far north as Sheldon Lake and in the area adjacent to Dease Lake south of Watson Lake. All of these areas were found favourable for the extension of triangulation.

TRIANGULATION ADJUSTMENTS

Continued progress was made during 1944 with the adjustment and computation, on the 1927 North American datum, of recent triangulation extending along coast lines in Eastern Canada. Through the use of this datum all triangulation in the United States, Mexico, and Canada, is placed upon a uniform basis. This uniformity of datum eliminates any lack of agreement in the charted positions of points common to the maps of the two countries adjacent to the International Boundary.

The summer of 1944 marked the completion of the field work of a single but lengthy loop of primary triangulation encircling the Gulf of St. Lawrence. As a result of this loop closure, all the triangulation in Newfoundland and along the north shore of the Gulf east of Anticosti Island may now be subjected to a final adjustment. Toward the end of the fiscal year, a start was made on the final adjustment of the Newfoundland sections of this loop. According to the agreement between the Canadian Government and the Commission of Government of Newfoundland, the Geodetic Service of Canada agreed to make the adjustments and to compile and publish the resulting geodetic data pertaining to the Newfoundland section.

The adjustment of the Hamilton (Ontario) Harbour triangulation net was carried out and all mathematical data reduced in terms of plane rectangular co-ordinates as well as in terms of latitudes and longitudes. When the new harbour line along the Hamilton water-front is defined and surveyed, a partially-completed report involving the compilation of all relevant survey data will be finished and forwarded to the Department of Public Works.

A great many requests for triangulation data have been received and answered. The distribution of available publications has been continued to Provincial and Federal Government survey bureaus and to private surveyors and engineers.

A limited amount of mathematical research has been carried on into problems arising out of current geodetic operations. A further study has been made of long geodetic lines and of certain survey projections suitable as a basis of transfer of geographical positions expressed in terms of latitudes and longitudes to rectangular co-ordinates in linear units on a plane surface and referred to a local origin.

LEVELLING

General.—For the first time since the fiscal year 1939-40 regular levelling operations were in progress. In the intervening years the field activities of the Levelling Division were confined to inspection of bench marks and to certain special war projects requiring precise levelling which were carried out at the request of the Department of National Defence.

Co-operating with the United States Government, the Canadian Government undertook, preparatory to postwar development in the Northwest Territories, the extension of the Canadian precise level net from Edmonton, Alberta, to join at Whitehorse, Y.T. the precise level system established in 1943 in the Yukon Territories and Alaska by the U.S. Coast and Geodetic Survey. The distance from Edmonton to Whitehorse is 1,400 miles, but as precise levels had been extended to a point 168 miles from Edmonton the actual distance to be levelled was 1,232 miles. Two double-unit levelling parties operated during the season on this extension. One party, working on the Northern Alberta Railway, carried levels from Slave Lake, Alberta to Pouce Coupe, British Columbia. The other party, working on the Alaska Highway, carried levels from Pouce Coupe to a point about 75 miles south of Fort Nelson. At the end of the season there remained some 670 miles to be levelled before reaching Whitehorse, where the junction with the United States levels will be made. The completion of this line will add an important link to the international level system of North America and in addition will provide basic vertical control which heretofore has been entirely lacking in a large undeveloped area of northwestern Canada.

During the summer a reconnaissance was made preparatory to winter levelling operations which would extend from Lac Seul across Lake St. Joseph and down the Albany River to Patricia District of northern Ontario. The purpose was to furnish basic vertical control on the upper Albany River for investigation of water-power possibilities in an area of potential post-war mining developments. This is the first time winter precise levelling has been carried out by this Service since the Winnipeg and English Rivers levelling in 1922-23. In the winter operations of 1944-45 aeroplanes for transportation were used for the first time by a levelling field party in Canada. Owing to a late autumn and an early break-up in the spring, the actual field season was restricted to some two and a half months.

The regular inspection of precise level bench marks was continued in the Provinces of British Columbia and Alberta. Inspection of secondary bench marks was carried out in the Peace River District and in northern Alberta.

In the autumn, precise levelling in the Hamilton (Ontario) Harbour area was carried out.

Alberta.—Precise levelling was carried over the Northern Alberta Railway from Slave Lake, Alberta, to Pouce Coupe, B.C., and from McLennan to Hines Creek, Alberta, under the supervision of George S. Raley. On this party two complete units operating from a central camp were tried out for the first time in the history of this Service. This organization has certain advantages as it permits the training of more than one engineer under the supervision of an experienced officer and also requires only one cooking establishment. V. M.

Wallingford and A. B. Farnam were engineers in charge of the two levelling units. Railway motor cars were used for transportation of the units working along the railroad, and camp was moved by loading the outfit in a box car and shipping by freight to the next site.

During this season a start was made on the inspection of iron pipe bench marks established by the former Topographical Survey, Department of the Interior, when running secondary levelling along meridians and base lines in the Prairie Provinces. Although this type of bench mark had been used as early as 1915, no inspection of these iron pipes has been carried out, and in view of the extensive post-war levelling program it was considered of vital importance to ascertain how this type of bench mark withstood the ravages of time. The inspection was carried out by R. H. Montgomery and covered the Peace River District and a section of Alberta lying immediately south and east of Edmonton. The results of this inspection justify the continued use of this type of mark as, when left undisturbed by human agency, it showed surprisingly small signs of corrosion and apparently holds its elevation. Man is the most destructive agent in the life of these iron pipes, and the inspection uncovered many object lessons which can be utilized to secure more protection and a longer life by judgment in the selection of sites of these bench marks.

British Columbia.—A double-unit party carried precise levels from Pouce Coupe, B.C., northward along the Alaska Highway to a point about 75 miles south of Fort Nelson. D. McMillan was in charge, and W. V. Morris and D. R. Webster were his assistants. Transportation equipment consisted of two two-ton trucks and one passenger car. Through the courtesy of the U.S. Army, the motor vehicles secured gasoline and oil from Army depots along the highway. The progress of levelling operations was held up by the heavy grades encountered on this section of the highway. There was no bed rock available for permanent bench marks, and ordinary gravel for the concrete used in making piers was hard to find and at times had to be transported 50 miles. Standard iron pipe bench marks were placed about 2·5 miles apart, and at least every 20 miles a concrete pier was erected or use was made of a concrete bridge abutment.

During 1943 all precise level bench marks along Canadian Pacific Railway lines in the Province of British Columbia were inspected; during 1944 this work was continued by F. B. Reid along Canadian National Railways lines, i.e., from Prince Rupert to Red Pass Junction and from the Yellowhead Pass to Kamloops, Kelowna, and New Westminster. The inspection was then extended into the western portion of Alberta, covering all bench marks west of Edmonton, Calgary, and Lethbridge, including the Northern Alberta Railway from Edmonton to Slave Lake station. In all, some 700 bench marks were inspected, 555 of these having been established by the Geodetic Service and the remainder by other organizations, mostly the former Topographical Survey of the Department of the Interior. Of the 555 G.S.C. bench marks inspected it was found that 57, or 10 per cent, had been destroyed.

As in previous inspection work new or revised descriptions of a large number of the bench marks were made in order to bring the descriptions up to date.

Northwest Territories and Yukon.—A reconnaissance trip was made by R. H. Montgomery by automobile and truck over the entire Canadian portion of the Alaska Highway and subsidiary roads connecting with it. The subsidiary roads were covered as far as the road surface would permit travel by automobile and as most roads were not gravelled the weather was the controlling factor. The following roads running from the highway were examined: to Hudson Hope, Beaton River Airstrip, Smith Airstrip, Carcross from Whitehorse, Carcross from Johnson Crossing, Dawson Trail, Aishihik Airstrip, Haines Cutoff, and Snag Airstrip. Towards the end of July the Canol Road, length 500 miles, was covered

except a 65-mile portion not then constructed, the southern portion by automobile as far as Sheldon Lake, the northern portion from Norman Wells by U.S. Army truck to Cariboo Pass, a distance of 200 miles. The purpose of this latter rapid reconnaissance, carried out in connection with the North Pacific Planning Project, was to ascertain the possibilities of extending vertical control into this area and for planning post-war operations for aiding future development.

Some fifty bench marks picked at random were inspected between Carcross and the Alaska-Yukon boundary. These bench marks were established in 1943 by the U.S. Coast and Geodetic Survey when the present highway was being constructed. This inspection revealed that due to faulty descriptions caused by changes in the highway after the bench marks had been established there was a grave danger of many of the bench marks being unrecoverable. A recommendation was made that Canada should carry out in 1945 a regular inspection for the purpose of preserving the ground record of this important contribution to Canada's national level net.

Northern Ontario.—During the summer, a canoe trip of some 500 miles was made by R. H. Montgomery from Sioux Lookout, Ontario, via Lac Seul, Root River, Lake St. Joseph, Albany River to Fort Hope and thence south to Ombabika. The purpose of this trip was to select a route to be followed by subsequent winter levelling, to set permanent bench marks, to arrange for supplies, to determine the type of winter transport, and in general to ascertain how to carry out the winter operations efficiently. The canoe trip proved to be arduous and strenuous, and the weather was damp and cold. The upper Albany is remarkable in having black rocks close to the surface of the water and is on this account dangerous for navigation by boats or for landing by planes. As Canadian Pacific Airlines refused to land planes on the Albany River either on water or ice it was necessary to use dog-teams for the winter operations along rivers. Ski-equipped planes were used for transporting the party from and to Sioux Lookout and for bringing in supplies when required. Very satisfactory contact was maintained by a radio telephone transmitter-receiver during the winter with the Department of Transport radio station at Sioux Lookout.

The winter operations were divided into two classes, namely, precise levelling over the ice surface of rivers, and water transfer of levels under ice cover across lakes. The precise levelling party, in charge of V. M. Wallingford assisted by D. R. Webster, left Sioux Lookout on December 30, this date being the earliest that ski-equipped planes could land safely on Lac Seul. Precise levels were first carried up the Root River from Lac Seul to Root Portage on Lake St. Joseph. The party was taken by planes across Lake St. Joseph to Rat Rapids, and levels were carried down the Albany River to the Upper Eskakwa Falls which was reached on March 20. The next day the party was taken by plane to Sioux Lookout. The winter was unfavourable for levelling operations by reason of the exceptionally short season. The snowfall was less than average, and snowshoes were not required until February. Winter operations entail considerable hardships on the men and no fewer than three members became casualties and had to leave the party. Two dog-teams of five and six dogs, respectively, transported the camp equipage along the rivers and brought supplies from plane landings to camp. Dog-teams with drivers were hired locally, and this arrangement was not very satisfactory nor efficient.

The water transfers under ice cover were carried out during the first half of January. Three gauges were established on Lac Seul—at Hudson, Lac Seul Post, and mouth of Root River. Two gauges on Lake St. Joseph were set at Root Portage and Rat Rapids. Simultaneous gauge readings were taken daily at 9 a.m., 1 p.m., and 5 p.m. on all five gauges for a period from 7 to 10 days. During the period of gauge readings the weather was favourable for securing accurate water transfers as the temperature was low, running from 10 degrees

below to 44 degrees below. There were no strong winds, and there was very light snowfall. Levels were transferred about fifty miles across Lac Seul and sixty-five miles across Lake St. Joseph. The transfer operations were carried out by R. H. Montgomery, and planes were used for transportation.

Hamilton (Ontario) Harbour.—In connection with the triangulation net covering Hamilton Harbour, which was carried out for post-war planning by the Public Works Department, precise levelling was carried out by E. W. Berry connecting nearly all triangulation stations along the harbour front. Each triangulation station thus becomes a precise level bench mark.

Detailed Statement of Precise Levelling Run in 1944

	Miles	B.M.'s
Slave Lake to Pouce Coupe	325·6	115
McLennan to Hines Creek	119·2	51
Pouce Coupe to Mileage 233·7	241·7	102
Albany River levelling excluding water transfers	100·	22
Hamilton Harbour	13·	16
Total	799.5	306

Summary

Precise Levelling		
Prior to 1944	26,444	9,405
1944	800	306
Total	27,244	9,711
Secondary Levelling	Miles	B.M.'s
Prior to 1944	12,102	4,314
1944	...	...
Total	12,102	4,314

The total mileage of levelling in the Canadian level net, distributed by provinces, at the end of the fiscal year 1944-45 was as follows:—

	Precise	Secondary	Pub. Works	Total
Nova Scotia	779	....	309	1,088
New Brunswick	1,106	....	403	1,509
Quebec	3,418	1,288	2,231	6,937
Ontario	7,069	1,324	2,012	10,405
Manitoba	2,963	368	113	3,444
Saskatchewan	4,113	5,098	....	9,211
Alberta	3,291	3,799	....	7,090
British Columbia	3,952	225	....	4,177
Yukon	458	....	....	458
Minnesota	89	....	....	89
Vermont	6	....	....	6
	27,244	12,102	5,068	44,414

GEODETIC ASTRONOMY AND ISOSTASY

The field work of the Division of Geodetic Astronomy and Isostasy during the season of 1944 consisted of Laplace determinations at three stations of the geodetic triangulation in the Lower St. Lawrence and Newfoundland nets, one precise longitude and latitude determination at Port aux Basques, Newfoundland, six precise latitude and longitude observations on that portion of the 60th parallel which constitutes the Yukon-British Columbia boundary line; thirteen longitude and latitude determinations in Yukon and Mackenzie River districts, thirty-one longitude and latitude determinations in northern Quebec, four longitude and latitude determinations on islands near the east coast of Hudson Bay, twenty-three longitude and latitude determinations in northern

Ontario between Moosonee and the Manitoba boundary, and one observation in northern Manitoba at Vaughan Lake. Observations for astronomical longitude and latitude were also made at six triangulation stations in Quebec for the determination of the "Deflection of the Vertical", and one base line in the St. Augustine River secondary triangulation in Quebec was measured. Also, the engineers engaged in astronomical work in the Yukon, in the Mackenzie River district, along the 60th parallel, in northern Quebec, northern Ontario, and northern Manitoba, made determinations of the magnetic declination.

Laplace Determinations.—Laplace determinations (astronomic longitude, azimuth, and latitude) were made by D. J. Fraser at three triangulation stations in the Gulf of St. Lawrence area—Ledges, South Base at the northerly end of the Augustine River secondary net, and Cape Norman in Newfoundland. The azimuth observations were made on the lines Ledges to Bradore, South Base to North Base, and Cape Norman to Bauld. The Laplace observations at Ledges and Cape Norman are to control the direction of the triangulation in the Gulf of St. Lawrence net and that at South Base (Augustine River) to furnish azimuth control for that secondary net.

Precise Longitude and Latitude.—At the request of the Department of National Defence (Naval Service) T. C. Dennis made a precise longitude and latitude determination at Port aux Basques, Newfoundland. The information thus secured was to be used in certain confidential and secret investigations being made by the Naval Service in co-operation with officers of the United States forces. It was necessary to correct the astronomical values for the Deflection of the Vertical as accurately as possible. These corrections were derived from the large number of such corrections obtained from the Deflection of the Vertical observations made in Nova Scotia, New Brunswick, Prince Edward Island, and Newfoundland.

C. H. Ney, who was loaned to the Commission marking the boundary between British Columbia and the Yukon during 1944, made precise longitude and latitude determinations at six stations along that boundary.

Longitude and Latitude.—During 1944 an extensive program of second order astronomical longitude and latitude determinations was carried out to provide control for aerial mapping. Four parties were engaged in this work, and aerial transportation was provided by the R.C.A.F. and Canadian Pacific Airlines. One party in charge of B. J. Woodruff operated in the Yukon and in the Mackenzie River district, and three other parties in charge of L. O. R. Dozois operated in northern Quebec, northern Ontario, and northern Manitoba. The engineers were L. O. R. Dozois, W. H. Stilwell, and Lieut. T. H. Manning.

Yukon and Mackenzie.—Mr. Woodruff's original program called for observations at some thirty-three stations, a large number to be reached in a single season of not more than three months in those northern latitudes. However, Messrs. Fry and Duncan of the Bureau of Geology and Topography of the Department who were operating east of the divide in the Mackenzie River basin, co-operated with Mr. Woodruff and occupied ten stations at or near the points allotted Mr. Woodruff. Also, it was found impossible to land in the neighbourhood of five of the points laid down and the bad weather conditions so delayed the progress of the work that five other points had to be abandoned. The stations occupied by Mr. Woodruff were: Chapman Lake, north of Dawson, Y.T.; Wind Lake and Kathleen Emery Lake, north of Mayo, Y.T.; Olive Lake and Niddery Lake, east of Mayo; Isabel Lake, southeast of Mayo; Petty Lake, north of Frances Lake, Y.T.; O'Grady Lake, at the headwaters of the South Nahanni River, N.W.T.; Margaret Lake between the headwaters of the Wind and Snake Rivers, Y.T.; Summit Lake, Y.T., near the headwaters of Rat River, southwest of Aklavik, N.W.T.; two stations on the Porcupine River and Hierlihy

Lake, north of Old Crow, Y.T., and nearly due west of Aklavik, thirteen in all.

Transportation for this work was provided by Canadian Pacific Air Lines. The weather conditions during the whole season were uniformly poor and some time was lost through repairs and overhaul to the plane assigned to the work. Altogether the plane engaged on this expedition covered approximately 16,000 miles during the summer.

Northern Quebec and Northern Ontario.—The geographical work in these regions was placed in charge of L. O. R. Dozois. W. H. Stilwell, on loan from the Dominion Astrophysical Observatory at Victoria, B.C., and Lieutenant T. H. Manning, on loan from the Naval Service, were the other observers.

Transportation was provided by the R.C.A.F., which placed three Norseman planes and a Canso flying boat at the disposal of the parties. Squadron Leader J. Hone was in charge of the flying personnel and made arrangements for the base camps, ferrying in of supplies, gasoline, etc. These arrangements proved most satisfactory and added greatly to the amount of work which was accomplished.

Early in June the parties and outfits were assembled at Mont Joli, Quebec, from where they were flown to Lake Mouchalagan in northern Quebec, where the first base camp was established. In the full season's operations, two additional base camps were used, one at Lake Clearwater in northern Quebec and the second at Lake Winisk in northern Ontario. The total mileage covered by the four planes was approximately 87,890 miles.

As some of the points required were on the islands off the east shore of Hudson Bay, the observations at these stations, as well as some other points in the northern part of Ungava, were assigned to Lieutenant Manning who for several years was engaged in exploratory and geographical work on Southampton Island. For the work on the islands it was impracticable to use the planes on account of the difficulty of landing along the rocky shore, and a boat was secured through the Hudson's Bay Company and manned by an Eskimo crew. Lieutenant Manning observed at Kidney Island, the northernmost of the two larger Sleeper Islands; Farmer Island, a small uncharted island; Driftwood Island, the largest of the King George Islands; Gilmour Island, one of the northerly Ottawa Islands, and Christie Island, near Mowatt Island, all in Hudson Bay. He also observed at Mistake Bay, Povingnituk Post, Kikkerteluk River, Scoter Lake, Bush Lake, Lake Minto, Lake Panchia and Sawbill Lake, thirteen stations in all.

L. O. R. Dozois observed at twenty points, nine in northern Quebec, ten in northern Ontario, and one in northern Manitoba. These stations are: Oternuk Lake, Big Lake, Perose Lake, Burns Lake, Savage Lake, Benita Lake, Upper Seal Lake, Muriel Lake, Mildred Marguerite Lake, in northern Quebec; Winisk River No. 1, Winisk River No. 2, Severn, Raeburn Lake, Junction Severn and Fawn Rivers, O'Reilly Lake, Beaver Lake, Severn Lake, Sherman Lake, Weenusk Lake, in northern Ontario; and Vaughan Lake, in northern Manitoba.

W. H. Stilwell observed thirteen stations in northern Quebec and thirteen in northern Ontario. These are: Lake Mouchalagan, in Quebec; Lake Opemiska, Lower Seal Lake, Elizabeth Lake, Lake Isabelle, Clearwater Lake, Pauline Lake, Kogaluk Lake, Richmond Gulf, Hunter's Lake, Lac Marest, Lake Edith, and Lake Jean, in northern Quebec; and Fort Albany, Attawapiskat, Albany River, Ekwan River, Attawapiskat River, Mallery Lake, Attawapiskat River No. 2, Kapiskau Lake, Attawapiskat River, Winisk Lake, Nibinamik Lake, Kasibonika Lake, and Pineimuta Lake, in northern Ontario.

It may be pointed out that the geographical control, established in a short northern season of barely three months in 1944, would under conditions of transport prevailing prior to the advent of the aeroplane, have taken many years to cover. When the methods of aero-mapping are perfected, there is little doubt

that at a comparative small cost detailed maps showing topography, physical features, natural resources, etc., will be available for even the most remote regions of the country.

Deflection of the Vertical.—T. C. Dennis made longitude and latitude observations at six geodetic triangulation stations in Ontario and Quebec to determine the values of the "Deflection of the Vertical". These stations were:—Gananoque Anglican Church, in Ontario; St. Alexander R.C. Church, Boundary Monument 647, Coteau E. Base, Huntingdon, and St. Isidore, in Quebec.

These "Deflection of the Vertical" observations are chiefly of scientific value, but requests made by the Department of Defence, Naval Service, for precise geographical positions in Nova Scotia, Newfoundland, and Labrador, during the past two years could not have been supplied if there had not been a mass of information available from a great number of Deflection of the Vertical determinations in the Maritime Provinces and Newfoundland. The study of isostasy, which had been under way previous to 1940, has, on account of pressure of the geographical operations made necessary for aero-mapping, been postponed, but in the near future it is the hope that this investigation can again be resumed.

Base Line.—One base line near latitude 52 degrees on the St. Augustine River to control the lengths of the secondary triangulation nets was measured by K. H. Robb.

Magnetic Observations.—In 1944, as in 1943, at the request of the Dominion Observatory, the field engineers, Messrs. Ney, Dozois, Woodruff, Stilwell, and Manning were provided with compass needles attached to the transit instruments, by which the magnetic declination at the several stations could be observed. Several hundred observations were again secured and supplied to the Dominion Observatory for reduction.

These magnetic data, secured as a sideline to the astronomic program, provide valuable information for flying maps in areas where such data have been very sparse.

GENERAL

Prince Edward Island.—The Geodetic Service has co-operated with the Prince Edward Island authorities in devising a suitable system of rectangular co-ordinates on the Lambert projection on which post-war provincial land surveys will be based. All permanently marked federal surveys on the Island, of which there is a considerable number well distributed over the Province, are being computed on the new projection, the use of which greatly simplifies survey calculations by Island surveyors.

Federal survey data included in this project were supplied by the Bureau of Geology and Topography, Geographic Section of the General Staff, Legal and Map Survey Division, and the Geodetic Service of Canada.

The Geodetic Service was also able to supply technical and other data on which provincial legislation authorizing the new system of survey operations could be modelled.

Telescope Tests.—A series of "field" tests was carried out during the year of the usefulness in astronomic and geodetic practice of the process of "blooming" telescope lenses to increase their optical efficiency by increasing the brightness and contrast of images.

These tests were carried out at the request of an English instrument firm which provided two identical telescopes, in one of which all lens surfaces were treated by the deposition of a film, about one-half wave-length in thickness, of magnesium fluoride. It is known that this process considerably reduces the light reflection at each air-glass surface, thus increasing the brightness of the image as well as the image contrast, and it was desirable to know by practical test under the clear atmospheric conditions in Canada if the process was

advantageous for telescopes employed in survey and astronomic practice, such as levelling, triangulation on signal lamps at night, picking up Polaris in daytime, increasing the range of suitable stars for astronomic determinations, etc.

A series of tests was carried out on many stars at night, on Polaris in daytime, and on precise level rods in daytime and at dusk. In brief, it was found that the "bloomed" telescope increased the brightness of star images by an order of one star magnitude, that Polaris was picked up in daylight more easily, that the contrast of blacks and whites on precise level rods was apparent, thus probably lessening eye strain in levelling operations, and it was concluded that very faint stars and faint triangulation signal lamps would be bright enough to work on with the "bloomed" telescope which would be too faint with an untreated telescope. The process hence appears to have a real application to telescopes used in survey operations.

INTERNATIONAL BOUNDARY COMMISSION

The Treaty of 1925 between Canada and the United States provides for the maintenance of the boundary line between the two countries in a state of effective demarcation. Boundary monuments deteriorate and at times are destroyed or damaged; changing conditions may require from time to time that the boundary be marked more precisely and plainly, by the establishment of new monuments or the relocation of old ones; and the boundary vista becomes filled in by fresh growth. For these reasons the above treaty was concluded and has empowered and directed the Boundary Commissioners to inspect the various sections of the boundary line at such times as they shall deem necessary; to repair all damaged monuments; to relocate and rebuild monuments which have been destroyed; to keep the boundary vista open; to move boundary monuments to new sites and establish such additional monuments as they shall deem desirable; to maintain at all times an effective boundary line between Canada and the United States; and to determine the location of any point of the boundary line which may become necessary in the settlement of any question that may arise between the two governments. In carrying out these treaty obligations the Canadian Section of the Boundary Commision engaged in the following activities for the present fiscal year.

Inspections by Commissioners

Early in August, Noel J. Ogilvie, the Canadian Commissioner, went to Niagara Falls where he met Nelson McCartney, the engineer of the Niagara Parks Commission. Together they inspected the new boundary triangulation marks on the approaches to the Rainbow Bridge and the tablets marking the intersection of the boundary line on the bridge itself.

Returning to Toronto, Mr. Ogilvie continued on to Sault Ste. Marie, Ontario, where he was joined by Hon. Thomas Riggs, the United States Commissioner, on August 6. The Commissioners spent a week here inspecting the work of the United States party in charge of Nelson Smith. They checked the calculations being made in the office and on August 10 and 11 made trips around St. Josephs and Sugar Islands inspecting the field work being done there.

From the Soo the Commissioners went to Detroit by way of Buffalo. While in Buffalo they called at the headquarters of the Eastern Division of the United States Customs and Border Patrol. In Detroit they consulted with the contractor for the new Hiram Walker grain elevator regarding the moving of Reference Monument 10 to a new site. This monument has to be moved to make way for the railway trackage to the elevator. The Commissioners then returned to Ottawa and Washington respectively.

On September 12 Mr. Ogilvie left Ottawa to inspect points on the boundary along the 45th Parallel and the Highlands. The monuments and vista at the places visited were all found to be in good condition and the Commissioner returned to Ottawa on September 16.

Conferences of Commissioners

No conference of the Commissioners was held this year. After an illness of some months the Commissioner for the United States, the Honourable Thomas Riggs, died at his home in Washington on January 16. Mr. Riggs was first associated with the boundary surveys in 1903, when he worked for the following three years on the survey of the 49th Parallel across the Rocky and Cascade Mountains, becoming chief of party. After a short period with the United States Geological Survey he joined the Alaska Boundary Survey and continued with it until 1914, during which time he was engaged principally on the survey of the 141st meridian from Mount St. Elias to the Arctic Ocean. Mr. Riggs was Governor of Alaska from 1918 to 1921. In August 1935 the President appointed him United States Boundary Commissioner, which position he held at the time of his death. His successor has not yet been appointed.

Maintenance Operations

Maintenance work was continued on the Highlands section of the boundary between Maine and Quebec. This section is so named because, according to the provisions of the Treaty of 1842, the boundary follows the crest of the watershed which separates the headwaters of the rivers flowing into the Atlantic Ocean from those flowing into the St. Lawrence River. This part of the boundary was first surveyed in 1844-45 and follows a very tortuous course over the roughest and most inaccessible part of the border east of the Rocky Mountains. Throughout most of its length of 175 miles it follows the summits of a range of high hills or mountains densely wooded with fir, hardwood, and underbrush. In many places it has been burned over and is covered with fallen timber and thick second growth. The whole section is a vast wilderness and is seldom entered except by logging parties operating in the winter over snow roads that are impassable in the summer, making it necessary for the surveyors to build their own trails.

Work was started on June 15 at Monument 341-7 and continued to 370 near Lake Emily. As the next move was a difficult one and there would not be sufficient time before the close of the season to complete all the work to be done from the new camp, the party was moved to a place a mile from the boundary on the road from St. Ludger to Dion's Camp. From this camp work was carried on until the end of the season between Monuments 393-13 and 396.

During the season 486 monuments were inspected and 3 of them repaired; 22 miles of boundary vista was recleared.

A Canadian representative was again attached to the United States party working along the St. Marys River between Lakes Huron and Superior. This season's work completed a program begun in 1938 of revising the boundary triangulation along the waterways connecting the great lakes. The first surveys had been done by the United States Lake Survey and by the International Waterways Commission and many of the triangulation stations had not been permanently marked and were lost or destroyed. As many as possible of the old stations were recovered and marked, new stations were established where necessary and each net was connected to the primary Geodetic triangulation of the United States or Canada. The geographic positions of the stations and monuments were then calculated on the North American Datum of 1927.

During this season the work was carried from Reference Monument 1 at the south end of the False Detour Passage between Cockburn and Drummond Islands at the north end of Lake Huron, to Reference Monument 23 at the north end of Lake George on the St. Marys River, a distance of 73 miles. Over this distance, 125 of the old triangulation stations were recovered and occupied and 77 new stations added to the triangulation; 2 boundary tablets were placed on the Canadian Pacific Railway bridge over the St. Marys River to mark the intersection of the boundary line with the bridge; and 3 reference monuments were moved to new locations.

A Canadian party was engaged on maintenance work along the Portland Canal on the Pacific Coast and from the head of the Canal northwards to the boundary crossing of the road up the Salmon River Valley to the Premier Mine. Portland Canal is a long narrow inlet, from a mile to a mile and a half in width and runs inland for about 80 miles. The towns of Hyder, Alaska, and Stewart, British Columbia, at the head of the Canal, depend on the mining operations in the district, of which the Premier Mine is the most important. The identity of Portland Canal was the cause of considerable argument before the Alaska Boundary Tribunal in 1903.

From the entrance to Portland Canal the boundary runs up the middle of the channel to Eagle Point at the southerly end of the ridge between the Salmon and Bear Rivers, which empty into the head of the Canal. From Eagle Point it runs northward to the intersection of the summit of this ridge with the 56th parallel of latitude and continues on in a northwesterly direction. The turning points of the boundary line through the canal are controlled by reference monuments which are set in pairs, one on each shore opposite the turning point they reference. These monuments had become covered with underbrush and many of them were hidden by logs and driftwood. There are 52 reference monuments along the canal and these were all inspected and the underbrush and logs cleared away so that the monuments might be plainly seen from the water. Five of them were found to need repairs and this was done.

From Eagle Point the boundary runs northward over Mount Dolly and Mount Welker and here the vista was recleared, as far as the crossing of the road to the Premier Mine, a distance of about 10 miles. The 10 monuments in this section were all found to be in good condition and none in need of repairs. A new monument, No. 10A, was established on the line just south of the road to mark the boundary crossing.

Miscellaneous

Another inspection of the offshore boundary range mark west of Point Roberts in the Strait of Georgia did not reveal any increase in the inclination of the tower. The pile foundation of the structure was reported damaged by teredo action in January 1943 and since then periodic inspections have been made to check any further indication of failure in the structure.

During the year consideration was given by a committee on which several other departments, as well as the Department of Mines and Resources, were represented to the question of the location of the boundary through Dixon Entrance on the Pacific Coast, which is still unsettled and a subject of discussion between the Governments of Canada and the United States.

Further progress was made on the preparation of the Commissioners' joint report on the southeast Alaska section of the boundary.

HYDROGRAPHIC AND MAP SERVICE

HYDROGRAPHIC SERVICE

The Hydrographic Service of Canada is responsible for the production and distribution of hydrographic aids to navigation. These nautical publications consist of the official navigation charts of Canada, the volumes of Pilots and Sailing Directions covering coastal and inland navigable waters, standard Tide Tables for the Atlantic and Pacific Coasts and also the Water Level Bulletins for the St. Lawrence-Great Lakes Waterway. Work of the Hydrographic Service contributes to the protection of life and property at sea, to the lowering of marine insurance rates and, in consequence, to the development of Canadian mercantile trade.

The above brief recital of normal functions of the Hydrographic Service would be incomplete without reference to activities conducted during the years of European conflict. Throughout this period close liaison has been maintained with the Defence Forces, and the entire resources of the Service have been devoted to meeting exigencies of war. On the outbreak of hostilities the Atlantic Coast hydrographic vessels *Acadia* and *Cartier* were lent to the Navy for various emergency duties. Since then, despite the serious handicap of the temporary loss of these surveying ships to this Service, a great number of important hydrographic operations have been carried out preliminary to the establishment of mine-fields, harbour defences, fleet anchorages, naval and air bases, submarine detecting devices, special convoy assembly areas, and in connection with many other defence measures. Unprecedented quantities of standard nautical charts were supplied for the use of the Royal Canadian Navy and Merchant Marine.

During the war, in addition to supplying the standard sea charts, over 100 special charts have been designed and prepared for the fighting services. These sheets cover world-wide areas of sea-warfare and include the official plotting charts used for routeing and convoy purposes, wireless direction-finding charts for Naval and Air Force use, navigation instructional charts, and numerous others of diverse and highly confidential nature. Also prepared were the many large-scale wall charts used for strategic purposes throughout Naval and Air Force Headquarters at Ottawa and at District Commands in Canada and Newfoundland. Supplementary to supplying these tangible contributions the Hydrographic Service, in personal interviews, placed much specialized knowledge of little-known and outlying portions of the coasts at the disposal of the Defence Forces. With so large a proportion of hydrographic facilities being devoted directly to war requirements, little leeway was left to meet even minimum civilian needs. In consequence, there has accumulated a heavy back-log of much needed charting in widely separated areas.

Administration of the various divisions comprising this Service was conducted from Headquarters at Ottawa, which office is also the clearing centre for general navigational information. The District Hydrographic Office at Victoria supervised the charting and tidal operations on the Pacific Coast and served as a distributing base for hydrographic publications pertaining to that seaboard. This geographic organization of the Hydrographic Service permitted closest contact with Naval Headquarters, Ottawa, and with the chart requirements of Naval Establishments on both coasts.

The fiscal year 1944-45 was marked by a substantially increased demand for standard navigation charts. Requests for naval operational charts remained at, or above, peak levels of 1943 and there was no recession in the call for active hydrographic work on ocean, lake, and river. The rapid march of war events on the Pacific caused an urgent demand for new navigation charts including a series to cover the principal shipping routes between Vancouver Island and the mainland. Layout of this set was designed to meet both the present situation as well as post-war requirements. Field charting and actual compilation for these and other special charts were well advanced.

Considerable progress in active coastal charting was accomplished in protected waters of the Atlantic Coast and in inshore waters of the Gulf and River St. Lawrence. All operations were carried on by the use of small motor-launches equipped with echo-sounding instruments, the hydrographic surveying ships *Acadia* and *Cartier* being retained under naval administration. In the five-year period during which these vessels have been separated from their normal hydrographic duties the charting of vast offshore areas has been held in abeyance. War service of the two ships has taken a very heavy toll in hull and engine wear and, in consequence, considerable study has been given to the matter of their replacement for hydrographic purposes in the post-war period.

The Tidal and Current Division continued its important function of obtaining and disseminating data pertaining to tides and tidal current movements in Canadian waters, the prediction of tides and currents, and the determination of datum planes for nautical charts and engineering purposes. As in previous years, much special tidal data were supplied on request to Canadian Government Departments, British Admiralty, United States Government, and the extensive fishing industries of Canada. Serving in a related capacity was the Precise Water Levels Division whose bulletins and reports of water surface elevations of the Great Lakes-St. Lawrence Waterway were in steady demand.

Exchange of Hydrographic Data.—In conformity with the policy of maintaining close co-operation with government and mercantile authorities concerned with shipping, numerous consultations were held and much useful nautical data were received from the Departments of Public Works, Transport, and National Defence. Reciprocating, this Service supplied these departments with the latest charts and related aids to navigation. Internationally, the Hydrographic Service of Canada constitutes a link in the chain of hydrographic services of allied maritime nations. Nautical information is exchanged, chart symbols and charting methods are standardized, and during the year there was no abatement in the flow of standard and confidential data circulating between this Service and the Hydrographic Offices in London and Washington. Through this co-operation the chart folios of the Fleets of Great Britain and the United States, like those of the Royal Canadian Navy, contain latest Canadian Hydrographic Service charts. At the request of the United States Hydrographic Office this Service collaborated in the compilation of a new Arctic Pilot and also in the preparation of extensive lists of place-names for coastal features in Frobisher Bay for submission to the Geographic Board of Canada.

Pilots and Sailing Directions.—The Hydrographic Service issues 13 volumes of official "Pilots and Sailing Directions" containing descriptions and precise instructions for navigating Canadian coastal and inland waters. Supplements to these reference volumes are published from time to time and urgent nautical information is advertised in the official Canadian *Notices to Mariners.* Upon request, mariners, shipping and engineering interests are supplied with special data relating to harbour and channel depths, water levels, recommended loading draughts, harbour facilities, ice-conditions, and general navigational information. During the year the following Pilots and Supplements thereto were published: *Lake Superior Pilot,* 2nd edition; *Sailing Directions for Lake Melville and Approaches;* Supplement to *Nova Scotia (S.E. Coast) and Bay of Fundy Pilot;* and Supplement to *Gulf of St. Lawrence Pilot.* In course of compilation was a first edition of a *Mackenzie River Pilot* to be added to as new navigational and hydrographic information becomes available. The Sailing Directions Section also continued to act as a ready reference service for supplying navigational information of all kinds through correspondence and personal contact.

Hydrography

Main projects included in the year's charting program were selected in accordance with their relative importance to the war effort. Nine hydrographic units were assigned to duties in various localities from the Atlantic to the Pacific. For economy purposes the work of each survey was made to tie in to, and contribute to, the established long-term scheme of coastal charting. Coastlining by the modern method of aerial photography, and sounding by echo, have greatly expedited hydrographic surveying. Summary reports of the work of each charting project follow:—

Atlantic Coast and Inland Waters

Atlantic Coast.—This unit, equipped with the launch *Dawson* and a small motorboat, completed the charting of Mahone Bay, N.S., in continuance of the previous season's operations. Actual field work commenced on May 26 and terminated on October 31. During the season shoal examination was also conducted north of Bull Rock, off Lockeport, N.S., and a special survey was made in Saint John Harbour for naval and harbour authorities. In January a measured mile was established in St. Margarets Bay, N.S., to enable naval vessels to try out their speeds. As a result of the season's work a modern large-scale chart of Mahone Bay will be available for navigation and existing charts will be brought up to date.

Summary of Season's Work

Boat sounding	950 linear miles
Coastlining	30 " "
Shoals examined	320

Gulf of St. Lawrence.—Fitting-out of the launch *Henry Hudson* was again undertaken at Charlottetown and from May 30 until October 21 charting operations were conducted off the south coast of Northumberland Strait between Wallace Harbour and Tormentine. Special examinations were conducted in Pugwash, Caribou, and Pictou Harbours.

As a result of the season's operations the proposed new coastal chart "Tryon Shoals to Cape Egmont" was well advanced.

Summary of Season's Work

Boat sounding	432 linear miles
Coastlining	12 " "
Shoals examined	88

Northumberland Strait.—The hydrographic launch *Anderson* conducted active charting operations in Northumberland Strait from June 1 to October 23. Main work was the continuation of coastal charting between Hillsborough Bay and Port Borden. In addition, special surveys and channel examinations were made in the following localities: Miramichi Bay, Caraquet Harbour, Richibucto River, Port Borden, and from Cape Bald to Cape Egmont. Previous to undertaking the work in Northumberland Strait, the officer-in-charge and one assistant conducted sweeping operations at the Reversing Falls, N.B., and ship range beacons were established to lead through in deepest water. After the close of the regular charting season, soundings and current examinations were conducted in connection with a marine disaster in Saint John Harbour.

As a result of the season's operations a number of special plans were supplied to various authorities, existing charts were brought up to date and further data were obtained for incorporation in the new chart "Pictou Island to Tryon Shoals".

Summary of Season's Work

Boat sounding	737 linear miles
Coastlining	41 " "
Shoals examined	12

St. Lawrence River.—The detailed charting of the St. Lawrence River from Quebec to Montreal progressed during the season. The hydrographic launch *Boulton* outfitted at Prescott and on May 24 proceeded to Sorel from where operations were conducted in the river stretch from Ste. Anne de Sorel to Lavaltrie. Strengths and directions of river currents were also investigated.

On October 23 the launch left the locality and carried out an examination of depths in the main channel east of Cornwall, Ontario. Survey operations terminated on October 25. As a result of the season's work considerable data were obtained for incorporation in the proposed new chart "Head of Lake St. Peter to Lavaltrie" and a copy of the original hydrographic data was supplied to the Department of Transport.

Summary of Season's Work

Boat sounding	239 linear miles
Coastlining	75 " "
Shoals examined	14

Newfoundland—Cape Breton.—This small unit, equipped with an echo sounding launch engaged exclusively in work requested by naval authorities. From June 9 to August 2, hydrographic examinations for chart correction purposes were carried out at Port aux Basques, Bay Bulls, and St. John's Harbour, Newfoundland. During the remaining portion of the season the entrance to Great Bras d'Or was charted; certain areas in Sydney Harbour were closely sounded, and tidal current velocities and directions there were ascertained. The work terminated on December 7.

As a result of the season's operations a number of existing navigation charts were corrected, a new temporary chart "Entrance to Great Bras d'Or" will be issued and a special plan of Port aux Basques, Newfoundland, was prepared for the Navy.

Summary of Season's Work

Boat sounding	175 linear miles
Coastlining	16 " "
Shoals examined	23

Great Slave Lake.—Shipping, in connection with extensive mining developments in this region, necessitated the resumption of charting for navigation purposes. During the years 1928 to 1931 the part of the lake and the harbours of refuge between the Slave and Mackenzie Rivers were charted. Charts from the Slave River to Yellowknife are now required and, with this in view, two hydrographers equipped with a small launch and echo-sounder conducted charting operations from July 1 to September 22. The main area sounded was Yellowknife Bay, but Buffalo River entrance and Ile du Mort were also examined. As a result of the work a large-scale chart "Yellowknife Bay" will be available and existing harbour charts will be brought up to date.

Summary of Season's Work

Boat sounding	504 linear miles
Coastlining	From air photographs
Shoals examined	53

Inland Waters.—An investigation of the movement of lake currents was conducted from June 1 to July 15 in a restricted area of Georgian Bay. From July 16 to September 22 somewhat similar charting was carried on in an upper reach of the Ottawa River. Confidential reports and plans were submitted to the National Research Council at whose request the work was undertaken.

Pacific Coast District

The Hydrographic ship *Wm. J. Stewart* left Victoria Harbour on May 4 and, after coaling at Union Bay, conducted sounding and sweeping operations in connection with a reported shoal in Nanoose Harbour. On the 8th and 9th a

large scale survey was made off White Cliff Point, Howe Sound, at the request of the Navy. From May 10 to 13 charting was carried on in the Strait of Georgia from Jervis Inlet to Savary Island. Thereafter, until June 10, surveys were conducted in Seymour Narrows and betweeen Capes Lazo and Mudge. While proceeding north the following day the vessel struck Ripple Rock and was beached in Plumper Bay. Extensive damage was done but the ship was salvaged and the necessary hull, engine, and equipment repairs were carried out in Victoria.

Hydrographic Houseboat Pender.—In the emergency caused by the accident to the *Stewart* this auxiliary hydrographic craft was put in commission at Victoria and arrived at Vanada, Jervis Inlet, on July 16. Here she was used as a base from which hydrographic work was conducted during the rest of the season. Actual charting operations were carried on by means of several small ship's launches equipped with echo-sounding instruments. Sounding and topography were completed in the Strait of Georgia from the entrance to Jervis Inlet to Cape Mudge, and Jervis Inlet was surveyed from the junction with Agamemnon Channel to the head, including Hotham Sound and Princess Louisa Inlet. Field work terminated on October 14.

As a result of the season's combined operations of the *Wm. J. Stewart* and houseboat *Pender* information was obtained for the production of a number of new navigation charts.

Summary of Season's Work

Boat sounding	1,300	linear miles
Coastlining	138	" "
Shoals examined	228	

Precise Water Levels

An important factor in the economic value of the Great Lakes-St. Lawrence Waterway is the maintenance of adequate lake and river levels. Extensive remedial works for water-level control have been constructed and the Precise Water Levels Division of this Service maintains a system comprising 47 inter-related self-registering water-level gauging stations extending from Quebec to Port Arthur. From the original records produced at these gauging stations, bulletins, graphs and special reports are prepared for public and private use, and chart datum planes are established.

On June 18 Lake Huron gauges recorded outstanding seiches. These oscillations were most intense at Goderich where the overall range was 3·95 feet in 54 minutes, the sharpest and largest fluctuation recorded at that location in over 30 years. Major seiches occur more frequently in Lake Superior than in the other Great Lakes and are considered to be the largest of any in the world.

During the year under review, from the 527 months of continuous recordings at the various field stations, well over 600,000 water-surface elevations were compiled into comprehensive tabulations. A total of 20,943 sheets of bulletins, profiles, etc., were issued and 12 monthly, 5 annual, 6 general data, and 5 graphic bulletins were also published. Considerable study was given to the problem of establishing a suitable standard low-water datum for the Mackenzie River, in connection with a proposed charting of that great waterway.

Tides and Currents

The Tidal and Current Division continued to serve the needs of navigation, coastal, and naval interests for information dealing with tides and tidal action in Canadian and Newfoundland waters. The annual Tide Tables issued by this Service are sold through the Department of Public Printing and Stationery.

Postmasters, custom's officers in seaport towns, maritime newspapers, libraries, and tourist bureaux are supplied free with single copies. Large quantities are acquired by the Department of Fisheries for distribution to fishermen generally.

The various editions of the Tide Tables for 1945 were produced for release in November, 1944, and progress was made on the preparation of the 1946 issue. Two complete editions, one for the Atlantic Coast and one for the Pacific Coast are published for shipping interests generally. Besides these, there are six abridged pocket editions to serve the needs of fishermen and others locally, four cover various localities on the east coast and two on the west coast. The publications are classified as follows:—

Atlantic Coast Tide Tables.—"Tide Tables for the Atlantic Coast of Canada", complete edition, which includes Tide Tables for St. John's, Newfoundland. There are also four abridged editions entitled "Quebec and Father Point", "Charlottetown and Strait of Canso", "Halifax and Sydney", "Saint John and Bay of Fundy".

Pacific Coast Tide Tables.—"Tide Tables for the Pacific Coast of Canada", complete edition. There are also abridged editions entitled "Vancouver and Sand Heads" and "Prince Rupert and Northern British Columbia".

Publications on Current and Tidal Streams for the assistance of navigation are, "Tables of Direction and Velocity of Currents in the Bay of Fundy and its Approaches"; "The Currents in the Gulf of St. Lawrence"; "The Currents in the Entrance to the St. Lawrence" (Gaspé region); "The Currents in the St. Lawrence Estuary, Ste. Anne des Monts to Father Point", and "Atlas of Current Charts for Hourly Stage of the Tide, Orleans Island to Father Point".

Other publications not bearing definitely on navigation are, "Tide Levels and Datum Planes, Atlantic Coast"; "Tide Levels and Datum Planes, Pacific Coast"; "Tide at the Head of the Bay of Fundy", and "Tide and Tidal Streams".

The principal tidal stations maintained in operation are:—

Atlantic Coast.—Quebec, Father Point, and Harrington, P.Q.; Charlottetown, P.E.I.; Saint John, N.B.; Halifax, N.S.; Churchill, Man. A station at Chicoutimi is operated during the open season.

Pacific Coast.—Vancouver, Caulfeild, Victoria, Clayoquot, and Prince Rupert, B.C.

Special Investigations of Tides and Tidal Streams.—Currents in the Fraser River, between New Westminster and Port Mann were investigated for the Department of Public Works and for nautical chart use.

Information Service.—Special tidal data were furnished to navigational interests, engineers, coast industries, and Government Departments. Information with regard to currents was supplied to various authorities in connection with marine accidents. Tide Tables for St. Augustine Bar in the St. Lawrence River were prepared for the Department of Transport, and tables for the arrival of the Petitcodiac tidal bore at Moncton were calculated for publication in the local press. Tidal predictions for a number of Canadian ports for 1946 were supplied to the Government of Russia.

Chart Construction

The Cartographic Division produced a substantially increased output of standard navigation charts. Owing to more stabilized naval and air operations in the Atlantic zone there was some easement in the call for the construction of new wall and special plotting charts for the Defence Forces. Marine cartography must be kept up to date with the constant advances in navigation and, in this

connection an innovation during the year was the printing of all coloured charts in special tints visible under the red lighting conditions used at night in ships' chart rooms.

In the period under review 154 charts and other navigational publications were printed as follows: 74 charts published in colours; 23 charts printed in black only including 9 reprints of Admiralty charts; 37 wall and special charts for the Defence Forces; 6 miscellaneous charts, 7 index maps; 6 patches for chart correction, and one supplement to the chart catalogue.

As a matter of war economy the list of nautical charts published during the year has been deleted from this report, but if mariners or other interested persons desire to secure the information, it can be obtained on application to the Surveyor-General and Chief, Hydrographic Service, Department of Mines and Resources, Confederation Building, Ottawa.

Distribution of Nautical Publications

In 1944 chart distribution reached new peaks of war-time volume as indicated by the following: 1939, 19,850; 1940, 33,136; 1941, 47,699; 1942, 50,968; 1943, 83,936; 1944, 106,042.

Nautical publications distributed during the year were as follows: Catalogue of Charts, Sailing Directions and Tidal Information, with Index Maps, 653; Navigational Charts, 106,042; Pilots and Sailing Directions, 1,040; Tide Tables, 45,088; Water-levels Bulletins, Graphs, etc., 20,943.

Many Canadian charts are reproduced in quantity by Hydrographic Offices of Allied Nations for the use of their own fleets: total world circulation of these publications is, therefore, greatly in excess of the above figures.

LEGAL SURVEYS AND MAP SERVICE

The principal functions of this Service are the preparation and distribution of a wide variety of maps and air charts covering Canadian territory, the making of legal surveys under the direction of the Surveyor General, and the photographing and printing of hydrographic charts.

The production of air navigation charts continued to be the chief work during the year and the total coverage of Canada and Newfoundland, comprising 221 sheets, was completed. Seventy-two of these sheets are standard, being printed in full colours, including elevation tints. The remaining 149 sheets are preliminary only. The process of improving the base maps by the addition of new information from air photographic data is proceeding. Of the 1,330,000 square miles of planimetry received from the United States Army Air Forces covering parts of Canada and affecting seventy-four of the eight-mile-to-one-inch sheets, 610,000 square miles, falling on thirty-seven different sheets, have now been adjusted into the maps printed. During the year, trimetrogon air photographs covering about 65,000 square miles, chiefly in the Yukon Territory, were received from the Royal Canadian Air Force, and good progress has been made in plotting this material by the new Air Photogrammetry Division recently established.

The curtailment of air training activities is reflected by a reduction of 14 per cent over last year in the total number of copies of maps printed, although output remains more than 500 per cent above peacetime production; there was also a decrease of 22 per cent in the number of jobs printed. The amount of printing is still too large for the Service's printing plant, and the Geographic Section, Department of National Defence, undertook a considerable amount of it. One of the larger jobs was the preparation of the drawings and the printing of 5,300 copies of each of 63 Federal electoral maps required in recording the soldiers' overseas vote.

Compared to the previous year there was a sharp drop of about 44 per cent in the number of maps sent out by the Distribution Division. However, on account of the large increase in the number of electoral maps, the overall decrease in distribution as compared to 1943 amounted to only 26 per cent, and is still 1,000 per cent greater than in the year 1938-39. It is to be noted that there has been a considerable increase in the distribution of the eight-mile-to-one-inch air edition bases to the general public. The total cash revenue from the sale of all classes of maps was $21,326.

Assistance to the Royal Canadian Air Force in the preparation of, and amendments to, the *Canada Air Pilot* (4 volumes) and the *Pilot's Handbook* (2 volumes) continued. The original preparations, with the exception of one volume of the *Air Pilot,* are completed. Amendments to the *Pilot's Handbook* are made each week and to the *Canada Air Pilot* about once a month.

Four major survey parties operated in the Yukon and Northwest Territories. One party was employed in the survey of base lines and meridians of the Dominion Lands Surveys System in the Mackenzie River Valley. The surveys are required to control the legal surveys of settlements and other developments. Another party commenced the legal survey of the right of way of the Alaska Highway; a third party performed miscellaneous legal surveys in the vicinity of Whitehorse, and a fourth, operating under the British Columbia-Yukon Boundary Commission, made some of the necessary precise latitude observations to control the demarcation of the boundary along the 60th parallel of north latitude. The latter three surveys were made necessary by developments consequent upon the erection of the Northwest Staging air route and the Canol Project.

During the year the tables of the "Transverse Mercator" or "Gauss Conformal" projection were printed and are now available for limited distribution. This projection has been developed and calculated by the Service for use on all maps of the National Topographic Series. A Manual for Plotting Trimetrogon Photographs comprising 111 pages was prepared and printed.

Legal Surveys

This division continued during the year to function as a central surveys unit for carrying out legal surveys required by Federal Government Services.

FIELD WORK

The construction of the Alaska Highway, the completion of the Canol Project in Yukon Territory, and the establishment of a system of airports in Yukon and Northwest Territories, created an urgent need for surveys in these areas. To meet this situation, a comprehensive program of control and miscellaneous surveys, planned to extend over a period of years, was launched in 1944.

Yukon Territory.—A legal survey was made of the right of way of the Alaska Highway from the point where it enters Yukon Territory to a point 150 miles westerly. This survey was of a semi-precise nature and in addition to defining the limits of the highway it was designed to serve as control for future miscellaneous surveys in its vicinity.

A number of miscellaneous surveys were carried out in Yukon Territory for the purpose of delimiting parcels of Dominion Crown Land occupied by United States authorities, in connection with defence projects, and by individuals; and for the purpose of formalizing the occupation of these parcels.

Also, as part of the system of control surveys adopted for the Yukon, a semi-precise control traverse was extended ten miles northerly from Whitehorse along the Whitehorse-Dawson Road.

At the request of the Department of Transport, legal surveys were made of the exterior boundaries of the Watson Lake airport reserve in Yukon Territory and of the Smith River airport reserve in British Columbia. This involved opening up and monumenting about forty miles of line.

As a preliminary to the demarcation on the ground of the British Columbia-Yukon boundary, astronomical observations for latitude were taken at six points along the 60th parallel.

Northwest Territories.—Commencing at the Sixth Meridian, the 36th base line was surveyed across ranges 1 and 2; the 37th base line was surveyed across ranges 3, 4, and 5; and the east boundaries of township 141 were surveyed in ranges 3, 6, and 10; a total of seventy miles. This is part of the system of control surveys adopted for the Northwest Territories.

As a result of increased interest in the mineral resources of the Yellowknife area, requests for instructions for the survey of 400 mineral claims were received and dealt with.

British Columbia.—At the request of the Penitentiaries Branch, Department of Justice, a topographical survey at five-foot contour intervals was made of a 450-acre parcel near Agassiz. A local surveyor was engaged for this work.

Ontario.—Instructions were issued to a local surveyor for the survey of an Indian settlement comprising 99 lots and access road in Constance Lake Indian Reserve in the district of Cochrane.

Miscellaneous surveys were carried out in Tyendinaga Indian Reserve in the County of Hastings for the purpose of re-establishing disputed boundaries of parcels granted to individual Indians.

At the request of the Indian Affairs Branch, a survey was made of an addition to a summer resort site on Hamilton Island in the St. Lawrence River, to be leased for the benefit of the Indians of St. Regis Reserve.

At the request of the Department of Veterans Affairs a recreational and health centre was surveyed at Sunnybrook Park, Toronto.

Quebec.—Retracement surveys were made of the boundaries of a large number of lots in Caughnawaga Village in the Indian Reserve of that name for the purpose of clarifying and adjusting titles thereto.

At the request of the Department of Veterans Affairs a recreational and health centre was surveyed at Ste. Anne de Bellevue.

Nova Scotia.—A number of adjoining farm lots were acquired by the Indian Affairs Branch and consolidated in one block to form the new Shubenacadie Indian Reserve. A local surveyor was engaged to verify the titles and to survey the exterior boundaries.

New Brunswick.—At the request of the Department of Veterans Affairs a recreational and health centre was surveyed near Fairview.

OFFICE WORK

Increased activity in field surveys during the year created a corresponding increase in the office work of this Division. In addition to preparing the instructions for the above listed surveys and to examining the plans, field notes, and other returns relating to them, the usual routine work of preparing descriptions, reports, plans, and sketches, relating to surveys affecting the 2,200 Indian reserves in Canada, was continued.

Two hundred and seventy-one descriptions for insertion in legal transfers and seven Orders in Council relating to land transfers were prepared, sixty-nine new plans were drawn, and thirty-nine additional plans were examined and checked. Sixteen hundred and eight blue prints or photostat copies from plans or field notes were requisitioned and sent out.

Eight hundred and sixty-four letters or memoranda relating to surveys were prepared for the Surveyor General's signature.

An extensive investigation was made of survey requirements in regard to Indian reserves with a view to providing post-war employment.

In response to requests from Provincial Governments, companies, and individuals, much information relating to surveys made under the Dominion Lands Surveys System in the Prairie Provinces prior to the transfer of the natural resources was supplied from records in this office.

Air Photogrammetry

This Division was set up during the year primarily for the purpose of plotting trimetrogon air photographs, the resulting plots to be compiled into the air navigation charts. The aim is to provide reasonably good pilotage charts, initially, over that part of Canada south of the Arctic Islands, and, subsequently, an extension northward as charts of these areas become necessary for air navigation purposes. The division performs other photogrammetric operations as required.

Furniture, instruments, and suitable lighting were installed, the equipment largely patterned after similar establishments in the United States, the birthplace of Trimetrogon Air Photography. From time to time, during the year, a staff of twelve operators was acquired, and their training has proceeded during production. A "Manual for Plotting Trimetrogon Photographs", consisting of 84 pages of typed material, with additional diagrams and tables, was prepared and printed for training and guidance in the work. Other aids designed and prepared by the division include six nomograms which are effective in simplifying and speeding up production.

A design for an instrument to determine the percentage of forward overlap in air photography was submitted to the Associate Committee on Survey Research. It was favourably received, and the construction of a model is likely to be undertaken in the near future.

A design was prepared for the Instrumental Analyses of Tip and Tilt. While this work has been completed, it has not yet been submitted to the Associate Committee on Survey Research.

A report was prepared on the application of multiplex equipment to trimetrogon mapping. The report was based on studies of American developments in this respect.

During the year trimetrogon air photographs covering about 65,000 square miles for mapping purposes in the Yukon-Mackenzie River area were received from the Royal Canadian Air Force. In addition, trimetrogon air photographs were received covering:—

The Alaska Highway from the United States-Yukon Boundary to Hyland River.

The Canol Road and Pipe Line from Norman Wells to Whitehorse.

Radio Range Teslin, Yukon, to Ottawa.

These have all been properly indexed and filed.

Of the photo coverage received, 25,000 square miles were laid down and the compilation 80 per cent completed. An additional 20,000 square miles, approximately, were 50 per cent completed. Also an area of about 20,000 square miles bordering the Arctic Coast has been 60 per cent processed for tilt analysis.

A great many people interested in this new photogrammetrical method have visited the office, some to study, some to compare, and some to instruct. These visits are beneficial to the Service, permitting exchange of ideas regarding the latest developments in the general science of photogrammetry.

Mapping

Mapping for the war effort again was the controlling factor in the activities of this Division. Early in the year the last seven charts of the eight-mile air navigation series were completed, thus giving a complete coverage over all of Canada at the one scale, and bringing the total number of charts issued in this series to 221. Of this number 72 are standard charts and 149 are preliminary only.

Many of these sheets were put under revision and during the year 35 preliminary editions for which air photography had provided new information were revised, and four former preliminary sheets were compiled as standard sheets.

Aeronautical information which is now overprinted in magenta on the eight-mile air navigation bases, and which is constantly changing, was revised for 170 air navigation editions.

With the gradual slackening off in the Commonwealth Air Training Plan, a corresponding reduction in the demand for air navigation charts took place so that some attention could be paid to other maps, stocks of which were exhausted and the revision of which was long overdue. Thus, the Natural Resources map, the 100-mile railway map of Canada, and four of the larger scale topographical sheets were partly revised.

Other miscellaneous revision included the Airways Facilities Planning Chart and the map showing the schools, depots, and recruiting centres under the British Commonwealth Air Training Plan.

The index maps to the National Topographic Series, showing the maps issued in the different provinces, were revised for all of Canada. New miscellaneous compilations included the 35-mile map of Northern Canada, West Part, and a map showing the Transportation Facilities in the Northwest Territories.

In the North American Plotting Series, three new charts, covering the Atlantic Coast, on scales of one to one million and one to two million, were completed and eleven other charts were revised. Two special plotting charts were also compiled—the Europe Southwest special plotting chart, at one to three million, and the Calcutta chart on the scale of one to one million.

At the request of the armed services, the computations and design for special charts were undertaken, and among miscellaneous projects were the preparation of indexes for the Columbia River Project, the Polar Bear Exercise, and operational base maps for proposed vertical and trimetrogon photography by the Royal Canadian Air Force.

In order to assist in registering the War Service Electors' votes, the printing of key maps of the electoral districts comprised in large centres was undertaken. Key maps for sixty-three electoral districts were compiled in volumes, of which over 5,000 copies were issued.

Office work other than map compilation included checking of field returns, the revision and extension of astronomical field tables, calculation and measurement of air line distances, and measurement of areas of the Arctic Islands and other topographical features, necessitated by new astronomical fixes and other new mapping information.

An important part of the work of the division is to co-operate with other mapping organizations by the exchange of mapping information. During the year 576 prints of various kinds were received, indexed, and filed for reference.

Magnetic Work.—The work of collecting, recording, and studying magnetic declination observations was continued throughout the year. Many new values obtained in areas throughout the Northwest Territories and Yukon, and northern Quebec, from whence no previous magnetic information had been recorded in this office, were received.

This magnetic information, augmented by the annual change data determined and supplied by the Dominion Observatory, is used in preparing magnetic diagrams and generalized isogonic lines for use on the air navigation charts, plotting charts, hydrographic charts, and topographic maps produced by this and the Hydrographic Service.

A considerable number of requests were received for magnetic information from other Government departments, Provincial Government offices, surveyors in private practice, and the general public.

Survey Records and Distribution

This division has charge of the registration and recording of all survey notes and plans affecting Dominion Lands and the distribution of topographical and geographical maps, air navigation charts, publications, and official plans. The main work of the Division consists in supplying maps requested by Government agencies and the public.

During the year 20,372 letters and requests were dealt with, 1,036,558 maps, air navigation charts and plans together with 3,561 publications were distributed. Up to the end of the fiscal year 22,360 books of survey notes and 40,180 plans have been placed on record. During the year 479 technical requests were dealt with, and 9,757 official plans were distributed. Owing to the pressure of war work no notification cards or publicity of any kind was sent out.

At present the stock consists of nearly eleven thousand items made up of about 2,000 maps and charts and nearly 9,000 official plans of townships, townsites, settlements, etc. These items run between 100 and 10,000 copies each. In one case during the past four years it was necessary to reprint a chart 45 times for a total of 518,000 copies in order to meet the demands of the Royal Canadian Air Force. The variety of items on hand requires that a constant inventory be kept, in order that reprints or revisions can be ordered before current stocks are exhausted. Estimates of future map requirements for periods of five or ten years are based on past experience, but stocks which were expected to last these periods are sometimes exhausted much earlier because of unpredictable factors which influence demand.

In addition to the maps published by this Service, this office is the sole distributing agency to the public of sheets of the National Topographic Series published by the Geographic Section, General Staff, Department of National Defence. Stocks of these maps are requisitioned from the Geographic Section as required. Also available from this office are topographical and geographical maps published by the Bureau of Geology and Topography. All of these maps are shown on the five indexes to sheets of the National Topographic Series which are available upon request. The five indexes are titled as follows: Quebec and the Maritime Provinces, Ontario, Saskatchewan and Manitoba, British Columbia and Alberta, and Northwest Territories and Yukon. In addition to the foregoing there are available indexes to the following series: Air Navigation Charts, Sectional Maps, Old Geographic Series and Land Classification and Soil Maps.

The established practice of giving priority to the requirements of the Armed Forces has been adhered to. During the year the restrictions governing the distribution of detailed maps of coastal areas and of air navigation charts were modified by the Chiefs of Staff Committee, Department of National Defence. The restrictions governing detailed maps now apply to the coastal areas only of the Provinces of British Columbia, Quebec, and New Brunswick, and to the entire area of the Provinces of Prince Edward Island and Nova Scotia.

Map Publication

The Draughting, Photo-Mechanical, and Lithographic Divisions make finished drawings, photograph them to the printing scales, prepare the printing plates, print the maps, and perform other related and miscellaneous tasks. Photographing and printing of the hydrographic charts are also done in this office.

In the Draughting Division, the drawings which were completed included forty-five air navigation charts, nine plotting charts, and sixty-three electoral maps. The 35-mile map of Northern Canada, West Part, was partly completed and corrections made for the revision of five small-scale maps of Canada.

During the year a total of 460 maps, charts, and miscellaneous jobs were printed, a decrease of 126 over the preceding year. The Map Service prepared

and have now on file all the relevant drawings, negatives, and printing plates, excepting the drawings of the hydrographic charts. The entire work of printing was completed by this Service at the Labelle Building, with the exception of thirty-seven jobs by the Geographic Section, Department of National Defence, and twelve by a local printing firm.

	Maps published 1944-45	Total copies
New maps printed	31	74,075
Electoral maps (new)	63	338,635
Maps reproduced	4	21,250
Maps revised	49	122,075
Maps reprinted	122	603,477
Hydrographic charts and Miscellaneous	191	162,103
Total	460	1,321,615

One hundred and eighty-two plates showing aeronautical data were overprinted on 354,981 air navigation charts. Five other plates were prepared for overprinting on 18,830 maps.

Of the thirty-one new maps printed, four were eight-mile standard air navigation charts in full colours, twenty-one were preliminary eight-mile air navigation charts in from two to four colours, one was an advance print of a standard eight-mile air navigation chart, and five were plotting charts.

The revisions included six standard eight-mile air navigation charts, twenty-four preliminary eight-mile air navigation charts, and eleven plotting charts.

Reprints were made of fifty-one air navigation charts, twenty-four plotting charts, twenty-two sectional sheets, eleven special war maps, thirteen miscellaneous maps, and the 100-mile map of Canada.

Miscellaneous printing jobs included special maps for various Government departments; base maps for subsequent overprints; settlement, township and subdivision plans; astronomical field tables, and manuals issued by the Map Service. Hydrographic charts to the number of 153 were printed.

Photo-Mechanical

The inception of war created a volume of urgent orders for maps of diverse types required by the Armed Forces, considerably in excess of the peace-time capacity of the Photo-Mechanical Plant. In order to step up pre-war tempo to the level needed to meet this situation, new reproductive methods, particularly the use of film, were adopted. Much investigational work and re-adaptation of equipment was carried out before satisfactory results were obtained. The large-scale use of film instead of the customary wet plate, as the chief photographic medium, has been instituted, after the solution of numerous technical difficulties, especially in regard to the control of shrinkage to ensure accurate scale.

The exigencies created by war-time shortages of essential chemicals and other materials were provided for by the accumulation of those anticipated as likely to become in short supply, and by experimenting with and stocking available substitutes. This policy operated so effectively that no shortages for the work of the Division occurred until 1944.

The production of maps in unusual sizes involving radical departures in production methods has been successfully achieved. The outstanding example consisted of a map measuring twelve by fifteen feet.

An important feature of the work of this Division was the development of a priority system in handling individual jobs, adjusted to maintain efficient operating conditions, so that the varying pressures in the demands for particular maps by the armed services could be promptly met.

The work performed in the Photo-Mechanical Division included: wet plate negatives, 1,162; photo-lithographic plates, 833; photographic prints, 4,012; vandyke prints, 1,671; vandyke printing, 7,105 square feet; blue printing, 237,166 square feet; photostat work, 8,454 sheets. Much of this work was done for other branches and for other departments.

As a war economy, a list showing the maps published during the year and those in course of preparation has been omitted from the report for the past three years and is again omitted this year. However, information regarding any of these maps may be obtained by writing to the Surveyor General, Department of Mines and Resources, Labelle Building, Ottawa.

Board of Examiners for Dominion Land Surveyors

The Board of Examiners for Dominion Land Surveyors held two meetings during the year. The first was a special meeting convened on December 4 in connection with an examination held in England in October for candidates in the Canadian Armed Forces. This examination was requested by the Director of Education, Canadian Legion War Services Overseas, and was held under his auspices. There had been sixty applicants, but only eleven of these remained in England long enough to write the Preliminary examination. One was successful.

The second meeting was the statutory one, held from February 12 to March 15. During this time examinations were conducted at Ottawa, Edmonton, and at Trail. Eleven candidates presented themselves, six for the Preliminary and five for the Final examination. Two candidates were successful at the Preliminary and four at the Final examination.

One Commission was issued to a candidate who had passed the Final examination and had furnished oaths of office and allegiance and bond for the sum of $1,000, as required by Section 25 of the Dominion Land Surveys Act.

Eleven Certificates of Preliminary Examination were issued to successful candidates who had complied with the requirements of the Act.

INDIAN AFFAIRS BRANCH

R. A. HOEY, ACTING DIRECTOR

Demands for Indian labour continued through the fiscal year and as a result economic conditions on reserves in most parts of Canada were maintained at a comparatively high level. Generally the fur catch was low, although good catches were reported from a few localities. Farming Indians had a fairly successful year with cattle raising showing good profits. Health conditions in the southern and more populated parts of the country showed improvement but this was offset to some extent by epidemics in previously isolated parts of northern areas.

Population

The quinquennial census of the Indian population was taken in 1944. The records of the Branch indicate that there has been a slow but steady increase in the population from year to year.

The following table shows the number of Indians by provinces according to the 1944 census:—

Province	Population
Alberta	12,754
British Columbia	25,515
Manitoba	15,892
New Brunswick	2,047
Northwest Territories	3,816
Nova Scotia	2,364
Ontario	32,421
Prince Edward Island	266
Quebec	15,182
Saskatchewan	14,158
Yukon	1,531
Total Indian population	125,946

A more detailed statement giving statistics of the Indian population under the headings of religion, age, and sex in the various provinces will be found in Table 1 on page 183.

The Indians and the War

The Indians throughout the Dominion of Canada have displayed a keen interest in the progress of the war, and have, since its outset, given ample evidence of their loyalty by voluntary enlistments in the Armed Forces and generous contributions to the Red Cross and other war funds. Indian women also have rendered valuable service in Red Cross work, knitting socks, mufflers, and other articles as well as supplying comforts for the soldiers.

The number of enlistments among the Indians in proportion to their population has been exceptionally good. More than 2,600 enlistments of Indians have been recorded. This figure includes also a few Indian girls who enlisted in the Army and Air Force. It must also be remembered that, undoubtedly, many Indians have enlisted of whom the Indian Affairs Branch has no definite information.

As an inevitable result of this substantial enlistment many brave Indians have laid down their lives in the cause of freedom. Since the outbreak of the war, according to Branch records, some 170 Indians have either been killed in action, died of wounds, or as a result of natural causes. Recently, word was received of the death of George Badger, an Indian of the Pelly Agency, Saskat-

chewan, who had been a Prisoner of War at Hong Kong since 1941. John Smallboy of the Moose Band, Moose Factory Agency, Ontario, has been reported to have been through the African, Sicilian, and Italian campaigns.

A magnificent record was established by an Indian family of the Cape Croker Agency. John McLeod, the father, served in the last war and with the Veterans Guard in this war. His six sons and one daughter enlisted in the Armed Forces. Two sons were wounded in action and two others paid the supreme sacrifice. Three Indians have been awarded the Military Medal. Gunner Dick Patrick, Royal Canadian Artillery, member of the Okanagan Indian Agency, British Columbia, was decorated for "gallant and distinguished conduct in the field". As stated in last year's report, Private Frederick Webster, Seaforth Highlanders, member of the Lytton Indian Agency, British Columbia, won the Military Medal. Private Huron Eldon Brant, member of the Tyendinaga Indian Agency, Ontario, was also awarded the Military Medal in the battle of Grammichelle in 1943. The Official Citation stated "he distinguished himself for his prompt and courageous attack with his Bren Gun on an enemy force of approximately 30 men, inflicting severe casualties. Private H. E. Brant totally disregarded his own personal safety in the face of very heavy enemy fire and made possible the killing or capturing of the entire enemy force." This gallant soldier was later killed in action in Italy.

The Department has assumed the responsibility of administering all estates of deceased soldiers. In all cases steps are being taken to effect proper and fair distribution. The utmost care has been exercised to see that dependants obtain the full benefit of pension and allowances.

Indian enlistments by Provinces are as follows:—

Prince Edward Island	24
Nova Scotia	110
New Brunswick	188
Quebec	181
Ontario	1,137
Manitoba	158
Saskatchewan	400
Alberta	128
British Columbia	270
Northwest Territories	0
Yukon	7
Total	2,603

In addition to the above, according to Branch statistics, 46 Indians enlisted in the United States Armed Forces. This figure is only approximate as Branch records are not complete.

The monetary contribution has been large; the following donations having been received from Indian bands and individual Indians throughout the Dominion:—

Canadian Red Cross	$11,742 50
Canadian War Services	1,787 45
Salvation Army	100 00
"War Effort"	2,732 51
Catholic Refugee Children	69 00
British War Victims' Fund	400 00
London Orphans' Fund	432 30
British War Effort	100 00
Queen's Canadian Fund	850 00
Canadian Aid to Russia Fund	610 84
Wings for Britain Fund	2,427 61
Total	$21,252 21

This represents only part of the contribution. Many subscriptions have gone directly to local organizations, and substantial donations of furs, clothing, and other articles have not been given a monetary value.

Northwest Territories

In the Fort Simpson Agency the Indians complained of trouble on their trap-lines through the depredations of wolves which robbed their traps, chased the game from the country, and destroyed rabbit snares and caches of meat.

The Trout Lake Indians of Fort Providence were obliged to move their families to the Mackenzie River above Providence owing to fires which ravaged the country last year. They reported good catches of fur at their new camp and plenty of fish in the river, although they were farther away from the good beaver swamps.

All Indians who had transportation suitable for the trip went to "The Fishery" on Great Slave Lake where the catch averaged 9,000 fish per scow, and more if larger scows were used. The fish makes a very welcome addition to the Indians' winter food as it is used both by the Indians and their dogs. As rabbits have been diminishing in some parts of the country, the Indians have been encouraged to obtain as much fish as possible for their winter needs.

The grain, hay, and garden crops at this agency turned out exceptionally well with an abundance of fodder for winter feed.

An increase in the number of lynx with particularly good prices was reported in the Fort Norman Agency. Muskrats were scarce in the Norman and Good Hope areas, but the beaver hunt throughout the agency was quite successful. The Good Hope Indians had an excellent spring hunt.

Fox were reported numerous in all areas but rabbits were fewer than expected. Prices generally for fur were slightly lower than last year. The Indians remained at the fish lakes during the month of October and had a good catch.

In the Fort Resolution Agency early summer rains were beneficial to gardens and prevented the spread of forest fires. It is usual for the Indians to have fur to sell or barter after the spring muskrat hunt but this year the catch was so small that they had to sell it as soon as it was caught in order to provide necessities for their families. Fishing operations were fair as also was the autumn duck hunt.

The Indians at Resolution and Yellowknife made good wages cutting firewood and at the mining camps and saw-mills. This was in contrast to conditions at Fort Rae where wage-earning jobs were few.

British Columbia

Notwithstanding the influence of war conditions, the general progress and well-being of the Indians was, on the whole, satisfactory during the year. Wages, especially in war plants, remained at a high level and employment was obtained in logging camps, saw and pulp mills, and by fishing, clam-digging, hunting and trapping, as well as other occupations. The hop industry proved particularly lucrative to casual workers among the Indians of the New Westminster Agency. They were paid 4 to 5 cents a pound for picking as compared with the old-time price of 1½ cents.

The National Parks Branch turned over 60 green elk hides to the Kootenay Agency for Indian use. These hides were in great demand for the manufacture of moccasins, gloves, jackets, and other articles. There was considerable demand for Cowichan sweaters and leather goods, and a sweater that formerly brought from $4 to $5 can now demand a market price of from $10 to $15.

There was a gradual improvement in the class of Indian dwellings as well as farm buildings and every possible encouragement was given to the Indians in this direction. Fifty-five new buildings were constructed and repairs were made to 43. Approximately $4,000 was spent on new fencing, clearing, and other improvements to Indian reserve lands, and efforts were made to ensure the continuation of the care of farms of Indians in the armed services and those undergoing long-term treatment in hospitals.

In all localities where conditions are favourable Indians are not only encouraged but urged to make agriculture or stock-raising their chief occupation. Crops were good in all interior agencies, with the exception of the Kootenay district where drought was general and both Indian and white farmers alike suffered a severe shortage of hay during the winter. It was necessary to extend assistance to some of the Indians to meet this situation. A considerable amount of seed was provided as in previous years.

The Indians engaged in cattle-raising had a successful year and the industry continued to expand. Prices were high which encouraged the Indians to dispose of most of their surplus stock. Good beef stock found a ready and profitable market. The Indians are learning to appreciate its value. Pure-bred bulls and good work horses were supplied during the year to eight Indian agencies. Goats were purchased for the Kamloops and Stuart Lake Agencies and this experiment continues to be watched with considerable interest. Although new farm equipment to the extent of $3,000 was purchased, Indians were encouraged to have their farm machinery repaired rather than replaced wherever possible. An Indian of the New Westminster Agency engaged in dairy farming installed a milking machine at his own expense.

The returns from salmon fishing in some of the fishing districts compared favourably with those of 1943, but in others the catch showed a marked decline and consequently was somewhat disappointing. The total salmon pack for the province in 1944 was 1,097,557 cases as compared with 1,258,221 cases in 1943. Indian fishermen were encouraged to engage to a much greater extent in halibut fishing in order to increase their earnings and offset any diminishing returns from salmon fishing.

Reports on trapping indicated that on the whole game and fur were fairly plentiful. Good prices for the latter prevailed and went far to compensate for any decline in catch occasioned by weather conditions or other causes. Extensive trapping was engaged in by the Pemberton, Douglas, Samahquam, and Skookum Chuck Indians in the New Westminster Agency and as the price of fur was high the Indians did exceptionally well.

Alberta

In Alberta the Indians took more interest in the manner in which their dwellings were kept and a start was made to fence in some of the houses to keep them separate from the outbuildings. Additional furniture was purchased and the general appearance of the homes was improved.

A number of Indians found employment in the United States and others worked for the railroads, packing plants, lumber mills, factories, and on ranches and farms. On the whole, the Indians had a good year, with employment easily obtainable, wages high, and excellent prices for cattle and other produce. Generally speaking, all Indians were warmly clothed, well-fed, and in possession of some ready cash.

Cattle came through the winter in good condition, particularly in the south, where mild weather prevailed. The Indians took more interest in the production of butter and milk, which was helped by butter rationing. Some Indians made butter for their own consumption. Returns from the sale of cream were good. Three Indians raised sheep on the Blood Reserve, and there were also a few head on the Blackfoot Reserve. A number were sold this year. Hog-raising increased slowly and good returns were obtained from sales. More Indians raised chickens, geese, and turkeys, both for the market and for home consumption. Live stock on the Blood Reserve increased in numbers and improved in quality. Work was continued in an effort to control the warble fly and satisfactory results were obtained.

Crops were only fair and the hot and dry weather which prevailed stunted the growth. In addition there were sawflies on the Blackfoot Reserve, and a heavy hail-storm caused extensive damage. In the irrigated area the crops had to be cut for feed. Indians in the Sarcee district suffered heavily from hail, as did some farmers in the Hobbema Agency.

On the Blackfoot, Blood, and Peigan Agencies combines had to be used to harvest the short crop which could not be tied with binders. Indians at the Saddle Lake and Lesser Slave Lake Agencies, with comparatively small acreages, had good crops. Crops on all reserves were harvested in good time. Work on the control and eradication of weeds was continued. Irrigation was successful and good results obtained.

Gardens were poor owing to drought at the Blackfoot, Blood, and Peigan Agencies and summer frost did much damage at the Stony Agency, although at the other agencies gardens were good. Community patches of potatoes were grown with only fair results.

Hunting and trapping varied in different areas throughout Alberta. Big game was fairly plentiful and the Indians had sufficient meat. The Stony Indians had a good catch of fur, but the Indians of the Athabaska Agency reported that the muskrat catch was considerably lower than last year. The Lesser Slave Lake Indians reported that fur-bearing animals were scarce as a result of the many bush fires during the past few years. Fishing was about average.

Saskatchewan

In Saskatchewan with the continuation of the war, demand for Indian labour came from the farm for spring and autumn work, and from the lumber camps for the winter months. In addition employment was provided in the cities by abattoir companies, oil refineries, and trucking and draying firms. Women were also in demand for work in restaurants and as domestics. It was reported by those who had worked in the harvest fields that individual Indians earned as high as $8 to $10 a day, and families made as much as $25 a day. This resulted in a substantial increase in revenue over that of the preceding year, not only for the farming Indians who got better prices for their produce, but for those who were depending exclusively on wages, or earning their living by fishing, hunting, and trapping.

Cattle increased over the previous year by about 450 head or slightly less than 7 per cent. One thousand and forty-two cattle were sold which brought in a revenue of $85,451.81, averaging $82.01 per head. The top price for steers was $120 per head. Of this number sold, 72·1 per cent were steers. In addition to the sale of cattle, an encouraging effort was made in the raising of hogs.

Spring work commenced much earlier than usual but growth was slow as the weather was cold. There was sufficient summer rain and the crops were cut and garnered in good time. The total grain harvested was 590,274 bushels. An attempt was made to raise flax and alfalfa seed, particularly in the Crooked Lakes Agency, and the results were encouraging. Taking wheat at an average of a dollar per bushel and coarse grain at fifty cents, the value of the crop at a conservative estimate was $400,000.

The Indians planted 526 acres in gardens and over a thousand tons of vegetables were raised. This did not include the amount used during the growing season but was estimated to be the crop taken off the harvest field. The Homemakers' Clubs did good work in an endeavour to stimulate the Indians' interest in their gardens, and continued active during the year. The work done by these Clubs, particularly by the women, has done much to improve the living conditions and general well-being of the Indians on their reserves.

There was a marked drop in fur prices over the previous year and a greater scarcity of fur-bearing animals. The sudden appearance of the timber wolf reduced the number of big game.

MANITOBA

Throughout the year the Indians in Manitoba enjoyed continuous employment at top wages and generally speaking they lived well. The good clothing and food which they were able to purchase contributed greatly to the improved health conditions. The Indians gave help to the white farmers and worked in paper and box factories, in the pulpwood industry, on the railways as sectionmen, and in the cities as truck drivers, and in coal yards and packing plants. Employment was always obtainable by Indians with the cold storage companies for filleting fish and for other work about the plants.

At the Fisher River Agency, the Indians built, without assistance, seven new homes, one of which cost over $5,000.

The Indians greatly increased the number and quality of their work horses and as a result they were in better shape to do good farming. Results from the cattle industry were not so good as expected. Sheep were kept by 24 Indians and the total count numbered 157, or an average flock of 15. Three registered Suffolk rams were purchased. The Fisher River Indians raised hogs, with good results.

Last spring large acreages were seeded with wheat, oats, barley, and flax. The weather was favourable during the growing season and all crops did well resulting in excellent returns. At harvest time heavy rains drenched the southern part of Manitoba and Indians on the Roseau River Reserve lost 150 acres of crop. Throughout the rest of the province all crops were successfully threshed and in some districts the yields were very high. While the hay crop was only fair, late autumn rains kept the pastures green and in many districts the cattle grazed out until late in November.

The potato crop was ruined by the extremely wet autumn weather. Many patches flooded and the potatoes rotted in the ground. Some Indians gathered in a good yield but the majority of the potatoes were water-soaked and did not keep well. As a result of the demand for labour the number of gardens showed a slight decrease as some Indians were off the reserves.

In some districts throughout Manitoba trapping was good, and at other points, fur was scarce. The muskrat catch was good. There was no open season for beaver and this made it difficult for some of the northern Indians, especially those in the districts where other fur was scarce.

Indian fishermen did well, both those who worked for themselves and those employed by the large companies. In most cases the catch was good and prices fair.

Indian women belonging to the 10 War Service Clubs in Manitoba remade over 1,500 garments. In addition these women have worked for the Red Cross and have sent parcels and cigarettes to Indian soldiers overseas. At the Griswold Agency the Club sent $202 to the Red Cross and the Fisher River Club sent a donation of $243.

ONTARIO

As a result of their improved economic situation, Indians throughout Ontario engaged in a type of employment never before offered them. Practically all able-bodied Indians not employed in agriculture, worked in the lumber camps, and in war work in industrial centres throughout the province. A group of Indians from the James Bay area were employed in a tannery near Guelph, this being in the nature of an experiment. These Indians had never before left the James Bay area.

Agricultural operations on Indian reserves in the central and southern part of the province were generally successful and an increased acreage was placed under cultivation. The growing season in most cases was favourable and practically all crops were harvested in good condition. An open autumn enabled soil preparation to be undertaken for the coming season. A marked increase

was again shown in the quantities of canning factory crops produced, particularly tomatoes, corn, and peas. In the Tyendinaga and Caradoc Agencies, these cash crops have reached such proportions that they represent the main source of revenue of most farming families. Hog production was increased materially at all southern agencies as a result of the importation of coarse grains from the west.

The development of home gardens for Indian families again showed a marked increase, and with few exceptions these families produced sufficient vegetables for a year-round supply.

The reforestation of submarginal lands on Indian reserves progressed satisfactorily and some 50,000 conifers were planted. Education of the Indians in reforesting their submarginal areas was continued.

Returns from trapping were well above the general average and provided a satisfactory revenue for the Indians concerned. Although market prices were not quite so high and the fur crop a little less plentiful than in the previous season, the Indians had an excellent year. Beaver remained at the regulated level and there was an increase in the price of fox. The development of the Kesagami Beaver and Fur Preserve, a 7,000 square-mile area in the James Bay district progressed satisfactorily. Since being established in 1941, restocking has taken place yearly, and this year 50 live beaver were liberated, the stock being transferred from Algonquin Park and Rupert House. Stocking of the Albany Game Preserve, containing 8,000 square-miles also, progressed and 12 live beaver were liberated from Rupert House. During the year a marked advancement was made in the defining of Indian registered trap-lines in the James Bay and Sturgeon Falls Agencies as the result of an arrangement completed with the province providing exclusive trapping rights over an area of 36 square miles for each Indian family of an entire township.

The Indians who engaged in commercial fishing in the various areas in the Georgian Bay and other waters of the province had the most prosperous year on record. Exceptionally high prices were received for their satisfactory catches.

Quebec

Many Indians in Quebec found profitable employment in war industries, in cutting wood, and in lumber camps.

Hunting and trapping Indians had a fair fur return and disposed of their catch at slightly lower market prices.

Salmon fishing increased substantially at the Bersimis Agency and all Indians disposed of their catch at attractive prices.

There was an increase in the number of vegetable gardens on the various Indian reserves. The potato crop was good on some reserves and generally satisfactory throughout the province.

Homemakers' Clubs continued to do good work and Indian women knitted and made garments from discarded military clothing.

Maritime Provinces

The Indians of the Maritime Provinces enjoyed a continued high standard of living through excellent employment opportunities in the steel industries, lumber camps, and on farms. The centralization policy in Nova Scotia and Prince Edward Island was continued with favourable results. Many Indian families are now occupying better homes, and living under conditions beneficial to their health.

INDIAN HEALTH SERVICES

In the southern and more settled parts of Canada there has been an improvement in health conditions, no doubt partly due to increased opportunities for work with better wages.

There have been epidemics of influenza, measles, whooping cough, and scarlet fever, comparable with epidemics in the white population. A typhoid epidemic occurred on the Little Saskatchewan Reserve in Manitoba but was soon brought under control. Sporadic cases also have occurred in southern British Columbia.

In certain northern areas that until recent years have been isolated and comparatively free from contagious diseases, there has been a marked increase in epidemics. This is due no doubt to the influx of service personnel who carried the infections among natives who have very little immunity and in areas in which economic conditions are very poor. As a result many deaths occurred. The comparative inaccessibility for both immunization and treatment make it very difficult to control such outbreaks. Smallpox in mild forms was reported in the Rocher River area of the Northwest Territories. Dysentry outbreaks have occurred due to deplorable living conditions of the natives and in one or two instances caused by the natives eating unfit meat or foods condemned by the armed services. Diphtheria has appeared in several areas with disastrous results.

The Medical Services have endeavoured to increase the immunization programs but this has been hampered for lack of personnel. Doctors and nurses have been instructed to immunize natives against smallpox, diphtheria, whooping cough, and typhoid wherever possible. Treatment has been supplied as early as possible in all reported cases.

The United States Medical Services, the Royal Canadian Air Force, and the Canadian Army Medical Services have co-operated whole-heartedly at every opportunity and Department officials wish to acknowledge these services and express their thanks and appreciation.

On reports of epidemics it has been necessary to send in doctors and nurses in many instances. The resultant cost of air transportation has been high.

Despite increased efforts by the Branch there have been an increased number of reports of venereal disease among the natives both in the southern areas and in certain isolated northern areas where venereal disease was hitherto a rarity. This increase is accounted for by the movement of population both in and outside the Services. Instructions for regular and adequate treatment have been forwarded to personnel in the areas concerned.

The treatment of tuberculosis has continued at about the same level as in the previous year. An increase in this program hinges on the future availability of beds. During the fiscal year 1944-45 there were:—

Admissions	1,057
Discharges	1,119
Average number of monthly tuberculosis patients	890

At the end of the fiscal year 903 were under treatment.

Treatment days	324,850

The above does not include casual admissions in general hospitals for a few days only. Departmental Indian hospitals averaged 314 patients a month. By Order in Council the Government appointed an Advisory Committee on the control of tuberculosis among the Indians which is representative of all the provinces in the Dominion.

Yearly clinics in residential schools have kept these institutions clear of active tuberculous cases. Certain other surveys were done, but those for case finding have increased very little over other years, but will increase as the Department obtains more treatment beds.

The Royal Canadian Air Force Hospital at Miller Bay near Prince Rupert has been turned over to the Branch for use in the treatment of tuberculous Indians. When in operation it is expected to be able to accommodate about 150 patients.

The United States Army Hospital at The Pas, Manitoba, has been acquired by the Branch for the treatment of tuberculosis. This hospital is ideally located and should accommodate about 150 patients when in operation.

In the summer of 1944 the Nurses' House at Fort Qu'Appelle burned down. The temporary residence is not satisfactory and has increased the already difficult problem of obtaining and holding nursing staff.

The Stony Indian Hospital at Morley was reopened last summer after the Department had obtained permission to purchase the necessary fuel-oil for heating purposes.

The Department has taken over the Mission Hospital at Fort Norman and during the year extensive alterations were made in this structure to increase the capacity and improve heating, lighting, and other facilities.

Staff difficulties continued to increase during the year. With the additional hospitals being put into operation, the nutrition investigation, the advisory work for the Northwest Territories Administration, and shortage of field personnel, the work at Branch Headquarters has increased tremendously in the past four years.

Owing to the shortage of help in departmental field work and on hospital staffs, many more nurses could be employed if they were available.

Lieutenant-Colonel P. S. Tennant, who was on leave to the Royal Canadian Army Medical Corps, has returned to his duties at Kamloops. The Army has seconded the services of Captain I. H. Mazer to this Department as Medical Officer at Fisher River, Manitoba.

Field nursing services have been established at the Bersimis and Abitibi Agencies, Quebec; at Driftpile, Alberta (Lesser Slave Lake Agency), and in the Yukon Territory.

An extensive post-war program for Indian Health Service has been planned which it is hoped will be realized in as short a time as possible. This includes the acquisition or building of several hospitals for the treatment of tuberculosis, the establishing of over 50 nursing stations on Indian reserves, and the development of a means of air transportation in the northern areas.

WELFARE AND TRAINING

TRAINING

A table of pupil enrolment and attendance follows:—

Fiscal Year	Residential Schools		Day Schools		Total		
	Enrolment	Average Attendance	Enrolment	Average Attendance	Enrolment	Average Attendance	Percentage of Attendance
1935-36.....	8,906	8,061	9,127	5,788	18,033	13,849	76·79
1936-37.....	9,040	8,176	9,257	5,790	18,297	13,966	76·34
1937-38.....	9,233	8,121	9,510	5,978	18,743	14,099	75·22
1938-39.....	9,179	8,276	9,573	6,232	18,752	14,508	77·36
1939-40.....	9,027	8,643	9,369	6,417	18,396	15,060	81·87
1940-41.....	8,774	8,243	8,651	6,110	17,425	14,353	82·37
1941-42.....	8,840	8,283	8,441	5,837	17,281	13,935	80·63
1942-43.....	8,830	8,046	8,046	5,395	16,876	13,441	79·64
1943-44.....	8,729	7,902	7,858	5,355	16,587	13,257	79·92
1944-45.....	8,865	8,006	7,573	5,159	16,438	13,165	80·09

Owing to the scarcity of teachers, considerable difficulty was again experienced in securing sufficient staff for day schools. However, through the co-operation of provincial officials and church representatives, only 15 schools were obliged to remain closed owing to our inability to secure fully-qualified teachers.

The distribution of vitamin biscuits was again made to Indian day schools in northern Ontario, Manitoba, and Saskatchewan. Twenty-two tons of these biscuits were distributed during the academic year.

During the past year a new classroom building was erected at the File Hills Residential School in the Province of Saskatchewan. The erection of a day school on the new Shubenacadie Reserve, Nova Scotia, was commenced and it will be in operation for the academic year 1945-46. An additional classroom was added to the Restigouche Indian Day School, Quebec. A second classroom was provided at the Kettle Point Indian Day School, in the Province of Ontario, and in the same province a school and teacher's residence were erected on the new Constance Lake Reserve. A considerable amount of repairs was completed at the residential schools and day schools. Owing to the shortage of both material and labour, it was not possible to carry out all the repairs that were necessary.

The main building at the Wabasca Residential School was destroyed by fire. This school is the property of the Church of England. Minor damage by fire occurred at the Ermineskin Residential School, in Alberta, and the Alert Bay Residential School, British Columbia.

The Church of England rebuilt the Indian residential schools conducted by the Church at Carcross, Yukon Territory, and at Fort George, Quebec. Both of these buildings had been destroyed by fire some years ago.

For some years the Branch has encouraged Red Cross work at the residential and day schools. During the period of the war a great deal of work has been done by the Indian pupils, under the direction of their teachers, to aid the Red Cross.

Vocational training at all residential schools and several of the larger day schools has been increased and worthwhile results have been obtained. As soon as qualified vocational teachers are available, further efforts will be made to increase the efficiency of the schools.

Indian Education Ordinary Expenditure 1944-45

—	Day Schools	Residential Schools	General	Total
Nova Scotia	$22,104 28	$29,609 57		$51,713 85
Prince Edward Island	1,028 45			1,028 45
New Brunswick	17,622 81			17,622 81
Quebec	66,057 59	4,878 76		70,936 35
Ontario	127,777 72	280,661 39		408,439 11
Manitoba	63,124 89	209,638 80		272,763 69
Saskatchewan	38,397 76	341,601 87		379,999 63
Alberta	1,004 09	351,566 87		352,570 96
British Columbia	89,311 92	370,929 37		460,241 29
British Columbia Vocational Instruction		9,580 14		9,580 14
Northwest Territories	1,510 50	42,301 21		43,811 71
Yukon	2,464 04	9,167 91		11,631 95
Assistance to ex-pupils			$21,100 78	21,100 78
Freight and express			14 01	14 01
Salaries and travel			20,625 48	20,625 48
Stationery			33,544 43	33,544 43
Miscellaneous			1,257 96	1,257 96
	430,404 05	1,649,935 89	$76,542 66	$2,156,882 60

WELFARE

The income of the Indian has been steadily increasing in recent years. This can be attributed in part to prevailing economic conditions. The income for the year amounted to approximately $16,000,000. Of this sum, farm revenue amounted to $3,700,000; wages, $6,800,000; sale of fish, $2,000,000; hunting and trapping, $2,400,000; interest disbursements, annuity payments, and casual revenue, $1,000,000. This income, on the whole, has been used intelligently and has enabled the Indian to enjoy a comparatively high standard of living. Relief costs show an increase, particularly at the northern agencies. This is due to a more liberal relief allowance to old and physically incapacitated Indians and to the present high freight rates on supplies to remote regions.

The policy of centralization in Nova Scotia has resulted in an increased expenditure in that province. Sixty new homes have been built on the Shubenacadie and Eskasoni Reserves. Indications are that the establishment of the Indians on these two reserves, where education and medical care can be more easily provided and where supervision is more effective, will result in a steadily increasing improvement in living conditions. The Indians have already shown a greater interest in the cultivation of gardens and in the raising of fowl and live stock.

There has been an increase in the number of cattle owned by Indians on reserves in the western provinces. It is encouraging to report that these cattle are equal to any range cattle in the West. The Indians of the Blackfoot, Blood, and Peigan Agencies now own approximately 10,000 head of cattle. The sale of live stock by Indians during the war period has enabled them to make a notable contribution to the food supply of the Dominion. Seventy-five pure-bred bulls —Shorthorn and Hereford—were purchased for breeding purposes. A number of pure-bred Holstein bulls were distributed to Indians in Ontario in an effort to improve dairy herds. Indian farmers are raising a large number of pigs, sheep, and poultry. Horses on reserves have been improved by the introduction of pure-bred stallions. Goats have been supplied to Indians in outlying districts, with the object of providing a supply of fresh milk for infants and Indians suffering from tuberculosis.

Indian Homemakers' Clubs continue to be active. The members throughout the winter season engage in the remodelling of discarded military clothing. Large quantities of useful wearing apparel have been provided for needy families. A new and promising feature of the work is the production of pyjamas, night-gowns, dressing-gowns, shirts, etc. These supplies are sent from time to time to Indians in hospitals and mental institutions. Instruction is also provided by these clubs in homemaking, sanitation, and the care and feeding of children.

Welfare Expenditure by Provinces 1944-45 and 1943-44

Province	1944-45	1943-44	Province	1944-45	1943-44
Nova Scotia	$ 107,566 16	$82,053 17	British Columbia	$84,226 68	$84,816 91
Prince Edward Island	9,763 22	10,317 48	Northwest Territories	14,829 21	14,357 60
New Brunswick	24,502 52	21,391 81	Yukon	12,596 86	9,814 54
Quebec	136,738 41	111,971 60	Headquarters Salaries	15,489 98	14,322 62
Ontario	107,221 90	105,054 32	Triennial Clothing	9,929 21	2,508 94
Manitoba	98,066 69	77,614 66	Miscellaneous	11,195 05	3,895 15
Saskatchewan	67,372 83	62,107 65	Handicraft	2,982 73	3,138 90
Alberta	63,853 34	48,725 43		$766,334 79	$652,090 78

HANDICRAFT

There was an ever-increasing market for Indian handicrafts, but the quantity of goods produced was considerably less than prior to the outbreak of war. Practically every able-bodied Indian was in the armed services or engaged in essential industry. However, those workers who found it necessary to remain on Indian Reserves, by reason of age or family responsibilities, made every effort to maintain the high quality of goods produced. To these craft workers should go the credit for holding the market throughout Canada, to which market Indians must look for the provision of employment in home industries during the post-war period.

While it was difficult to carry on the beadwork industry, it was possible under special permit to secure a small supply of beads for aged craft-workers who had no other means of earning a livelihood.

Several willow plantations were set out more than a year ago, and while the first harvest did not provide sufficient material for any extensive operations, there was ample material with which to carry on special courses for workers interested in producing what is, to Indians, a new type of basketry.

With a view to extending the scope of organized craft work, special short courses were arranged in pottery, silver work, lapidary work, and weaving, for a group of interested field workers, and the necessary equipment for cutting and polishing native Canadian stones was set up on one Indian reserve. From this small beginning it is hoped to promote an industry for Indian craftsmen whose forebears were skilled in the use of metals.

Owing to the impossibility of securing the necessary fine weaving yarns, the various weaving projects formerly in operation have been at a standstill. However, when yarns again become available it is the intention of the Branch to promote this line of endeavour also.

GRANTS TO AGRICULTURAL EXHIBITIONS AND INDIAN FAIRS

	1944-45
Ontario	
Ohsweken Agricultural Society, Brantford	$225 00
Garden River Agricultural Society, Sault Ste. Marie	100 00
Caradoc United Indian Fair, Muncey	150 00
Manitoulin Island Unceded Agricultural Society	150 00
Canadian Lakehead Exhibition	250 00
Mohawk Agricultural Society	100 00
Manitoba	
Manitoba Provincial Exhibition	250 00
Rossburn Agricultural Society	25 00
Saskatchewan	
Prince Albert Agricultural Society	400 00
Regina Agricultural & Industrial Exhibition Association, Limited	400 00
Alberta	
Calgary Exhibition	500 00
British Columbia	
North and South Saanich Agricultural Society, Cowichan	50 00
Windmere and District Fall Fair, Kootenay	175 00
Chilliwack Fair, New Westminster	50 00
Armstrong Fall Fair, Okanagan	250 00
General	
The Canadian Handicrafts Guild	50 00
Garden Prizes, Standing Crop Competitions	1,600 00
	$4,725 00

CONSTRUCTION AND ENGINEERING WORKS

Agency Buildings and Structures

Repairs and improvements were carried out at practically all Indian Agencies in Canada. A residence was purchased for the Indian Agent at Abitibi Agency, Amos, Que., to serve as living quarters and Indian office. A snowmobile garage was erected at the James Bay Indian Agency, Ont., and a garage for the use of the R.C.M.P. at Bersimis, Que. was provided. An approach to a float was constructed at West Coast Agency, and the float at Kitkatla Reserve, Skeena Agency, B.C. was repaired.

Roads and Bridges

Roads on Indian reserves throughout Canada were repaired and bridges and culverts replaced or reconstructed where required.

Water Supplies

A water supply was provided for the Agency residence at the Temiskaming Agency, Que. Stock watering dams were constructed at Peigan Reserve, Alta., a well was provided for File Hills Agency, Sask., and repairs were carried out to the water supply system at Bella Bella Reserve, B.C. Wells were cribbed at other agencies as required.

Fencing

Fences were repaired at a number of Indian Agencies in Canada.

Irrigation and Miscellaneous

Funds were transferred to the Surveys and Engineering Branch for the construction, maintenance, and repair of irrigation systems on Indian reserves in British Columbia. A list of these and other works undertaken by that branch for Indian Affairs Branch will be found in the report of the Surveys and Engineering Branch. Minor repairs, not requiring engineering supervision, were carried out at various Indian agencies including Kamloops, Kootenay, Lytton, and Stikine, B.C.

On behalf of the Indian Affairs Branch work was commenced by the Department of Public Works on the construction of a protection wall to prevent further erosion of the Walpole Island Indian Reserve, Ont.

Batteries for lighting plants were purchased for Pointe Bleue Agency, Que. and Walpole Island, Ont. A new lighting plant was also installed at Walpole Island. A cistern was installed at Fisher River Agency, Man., a pump at Griswold, Man., and furnaces and stoves were purchased for Manitoulin Island and James Bay Agencies, Ont., Touchwood Agency, Sask., Blood and Peigan Agencies, Alta. A boat was acquired for the Christian Island Agency, Ont., and motors and pumps for Fort Norman Agency, N.W.T.

At Fort Norman oil burning equipment was installed at the agency residence and a light and power plant installed for the agency buildings.

RESERVES AND TRUSTS SERVICE

RESERVES DIVISION

Land Sales and Leases

A total of 105 sales of Indian lands was made during the fiscal year, 68 being cash sales totalling $48,866.71 and 37 being time sales totalling $123,945.67. The total for the year was $172,812.38, or almost four times the total for the previous year. The actual increase in the number of sale contracts was only three.

While the number of sales shows only a small increase, the quadrupled value of the land sold is explained by the demand for farm lands in the western provinces rather than for low-priced subdivision holdings as in the previous year. A succession of good crops together with favourable prices has enabled farmers to acquire additional land while the return from farm products remains high.

The fiscal year was also featured by a substantial increase in collections on land sale agreements, the sum of $309,502.63 being received, of which $188,950.59 represented payment on principal and $120,552.04 payment on interest. As a result of the increase in collections, 160 old land sale contracts were paid in full and letters patent issued to the purchasers. Ten old contracts were cancelled for non-fulfilment of the conditions of sale and fourteen reductions were made by consolidation on order of the Board of Review under the Farmers' Creditors Arrangement Act. The total number of current time sales was 402 at the end of the fiscal year, a decrease of 156 within the period. Two hundred and four patents to Indian lands were issued on completion of sale contracts, an increase of 73 over the previous year.

Indian lands sold are for the most part made up of lands previously surrendered which later reverted to Indian ownership through cancellation of old sale contracts. Such lands are usually in isolated parcels in settlements predominantly white and in such situation are unsuitable for the use of this administration and surplus to Indian needs. The Department has set its face solidly against alienation by sale of lands for which there is any likelihood of Indian need in future years. Lands surplus to immediate needs are administered under leasing arrangements and from such lands substantial revenues have accrued. During the year rents collected under leases and permits (including the sum of $47,226.80 from oil leases and permits) totalled $331,267.33, an increase of $84,858.55 over the previous year. Revenues from this source have doubled in the past two years.

Adjustments Under Farmers' Creditors Arrangement Act

Eighteen land sale contracts were adjusted under the Farmers' Creditors Arrangement Act resulting in a gross reduction in arrears of $24,049.18 on account of interest and $6,690.23 on account of principal.

Acquired Lands

During the year a new Indian reserve to be known as the "Constance Lake Indian Reserve", comprising approximately 6,700 acres, was acquired from the Ontario Government at Calstock, Ontario, to provide accommodation for approximately 250 Indians who were formerly scattered along the transcontinental railway. This reserve has been surveyed and is presently in process of settlement and allotment.

Negotiations were started with a view to acquiring title in the Crown to the extensive lands in Indian occupation at Oka, Quebec, from the Sulpician Fathers. When title has been obtained it is proposed to administer this area as a duly constituted Indian reserve under the provisions of the Act, thus curing a situation that has been a most unsatisfactory one for half a century.

Negotiations were also completed for the acquisition of an old railway right of way across the Tyendinaga Reserve at Deseronto, Ontario, completion of which not only removed an encroachment that had been for many years a great detriment to the farming community but in addition the old road bed is being rapidly converted into a first class highway serving the reserve. The total cost of acquiring this land has been met by the surrender and sale of a very small part of it and all funds used in its acquisition have been fully restored.

Various small additions to reserves throughout Canada, most of them supporting Indian improvements, have been purchased and added to reserve lands, notably in the Province of British Columbia.

All of the above purchases were considered necessary to give proper services to the Indian groups concerned and the acquisition of these lands has made it possible to bring to the reserves affected the essential services for which the Act provides.

Petroleum and Natural Gas

New regulations were adopted by Order in Council dated July 13, 1944. Under these regulations 15 permits and 13 leases were issued, yielding a total revenue of $47,226.80, all from the Indian reserves in southern Alberta. Extensive geological and geophysical examinations were carried on by interested operators on the Sarcee, Blood, and Stony Reserves and one dry well was drilled to a depth of 6,000 feet. To date there has been no actual production of petroleum products on Indian reserves in Canada.

Mining

The only activity in hard rock mining was a certain amount of diamond drilling done on the Whitefish Bay Indian Reserve in Ontario. There were no results of an encouraging nature.

Sales of sand and gravel from reserves totalled $10,345.10.

Timber and Forestry

At the beginning of the year there were 32 timber licences in force, 7 of which were completed and 25 renewed during the year. Eleven new licences were issued. Thirty-six licences were current at the year's close. Revenue from timber sold under licence and permit amounted to $118,997.67, a slight decrease from the preceding year's returns.

Forest Protection

Fifty-nine forest fires were reported in connection with which $6,175.16 were spent in suppression. Indian fire wardens on various reserves did useful work of a preventive nature, the cost of which was in large measure borne by the Bands themselves.

Indian Estates

It has been noted in recent years that the administrative work in connection with the estates of deceased Indians has progressively increased and this fiscal year has followed the general trend, the increase being due largely to three factors.

It is evident that Indians, generally speaking, have become increasingly aware of the advantages to be derived from the administration of estates under the active supervision of the Branch rather than old tribal custom. This is particularly true of the western provinces.

Then, too, opportunities for employment have been far more numerous than for a decade previously and the increased value of farm products and fur has enabled many Indians to acquire land, live stock, and savings for the first time. Whereas in the past many estates had no administrative problem other than the distribution of personal property, the average estate now referred to the Branch consists of land, live stock, chattels, and funded savings, necessitating an increased amount of detail in the work required to distribute the assets among the heirs.

With regret, it must be stated that since the invasion of Europe by the Allied armies, a comparatively large number of Indians have lost their lives and in co-operation with the armed services the Branch has been concerned with the administration of the estates of these deceased Indian soldiers.

Indian Enfranchisements

There were 268 persons enfranchised and 96 women who received commutation under the provisions of the Act during the fiscal year.

Fur Rehabilitation

During the year marked progress was made in the work of rehabilitation of fur-bearers in the interest of the thousands of Indians who live by trapping.

One phase of this work has been the organization of Indians into family groups and imposing upon selected individuals a large share of responsibility for planned conservation in particular areas over which partial jurisdiction has been obtained by arrangement with the provinces. The work has been further extended to the education of such Indian groups in the proper principles of fur husbandry, fur production, and protection.

Seven beaver and fur preserves—five in Quebec and two in Ontario—are presently managed by the administration, comprising a total wilderness area exceeding 40,000,000 acres.

In addition co-operative arrangements have been made with the Prairie Provinces and assistance given them to extend their trap-line organization to areas predominantly in Indian occupation, and a successful effort has been made to secure more equitable treatment of Indians in the allocation of Indian trap-lines within the provinces. Attention has also been directed to the development of muskrat projects with the object of providing for the Indians a livelihood in a pursuit to which they are traditionally devoted and naturally suited. While certain monetary returns have already been obtained to the great advantage of the Indian participants, the success of the effort is more strikingly illustrated by the phenomenal increase of fur-bearers in the protected areas.

On one of the older beaver preserves, by actual census, the beaver population has increased from 490 to 3,895 in six years and on another from 500 to 1,985 in three years. It is expected that the two older preserves will come into substantial production in 1946 and the others will follow in rotation according to their age. Present estimates are that it takes seven years to bring a beaver preserve into production on a sustained-yield basis.

TRUSTS DIVISION

The Division administered 460 trust accounts belonging to Indian bands throughout Canada. On March 31, 1945, the aggregate fund totalled $16,637,651.37. A comparison with the previous year is as follows:—

Trust Balances	Capital	Revenue
March 31, 1945	$13,061,711 84	$3,575,939 53
March 31, 1944	12,742,657 44	3,050,527 03
Increase	$ 319,054 40	$ 525,412 50

The increase that has occurred this year is in line with that of last year and amounts since 1939 to more than a million dollars each, in the Capital and Revenue Accounts.

Items of receipts were: Accrued interest, land sales, land rentals, mining dues, timber royalties, oil land rentals, repayments on Band loans, and fines. Expenditures comprised: Capital and interest distributions, relief expenditures, band loans, agricultural assistance, road improvements, and enfranchisement. These outline the transactions in connection with Indian Trust Accounts and may be summarized as follows:—

	1943-44	1944-45
Total receipts credited to band funds	$1,814,071 94	$2,046,069 67
Total expenditures paid from band fund	1,048,657 86	1,201,602 77
Excess receipts over expenditures	$ 765,414 08	$ 844,466 90

The collection of debts owing to band funds by individual members incurred both this year and previously had continued with gratifying results.

Personal Savings Accounts

It is noted that deposits are somewhat less than last year but withdrawals are much less in the aggregate than was the case last year, leaving the net increase in funds on deposits at a higher figure than during either of the past two years.

Many Indians now discharged from the Forces are finding the savings deposited during their years of service to be of great assistance to them in their re-establishment. A considerable number withdrew their savings for the purchase of Victory Loan Bonds. The number of Indians whose Allowance and Assigned Pay Funds are being supervised by the Agents is decreasing, but valuable assistance in this connection continues to be given by the Branch.

Annuities

Some 50,090 Indians shared in the distribution of annuities in accordance with treaties made between the Indians and the Dominion Government. As in the past, almost every means of transportation was employed by treaty-paying parties. Aeroplane transport in this connection is becoming, in many instances, almost essential, both because it saves time and makes practicable the reaching of otherwise almost inaccessible areas.

No. of Chiefs paid at	$25	172	$ 4,300
No. of Headmen paid at	15	376	5,640
No. of Indians paid at	5	49,133	245,665
No. of Commutations of Annuity paid at	50	94	4,700
No. of Enfranchised Indians paid at	100	128	12,800
Amount paid on account of arrears for previous years			2,150
No. of Indians paid at (Abitibi)	4	122	488
Amount paid on account of arrears at	4		40
No. of Indians paid at	12	65	780
Total paid on account of above items			$276,563
General Advance *re* Robinson Treaty to be added			$ 8,000
Total			$284,563

It is worthy of note that during the fiscal year under review some 65 Cree Indians, living in the Rocky Mountain House region of west central Alberta, signified their desire to be listed for Treaty Annuity payments, and accordingly they were enrolled under Treaty 6. These were paid $12 each which is the initial per capita rate of annuity. Henceforth they will receive annually $25 for each Chief, $15 of each Headman, and $5 for each other Indian.

In addition to the above numbers receiving annuities from Federal funds there are some 11,749 Indians who also receive annuity under Robinson Superior, Robinson Huron, and Treaty 9 (James Bay). This brings the total number of Indians in Canada receiving Treaty annuity to approximately 61,839.

Band Loans—1944-45

During the fiscal year a total of $16,440 from band funds was loaned to 88 individual band members, the average loan being $186.82. The sum advanced was for the purposes and in amounts as follows:—

In the purchase of live stock and equipment	$6,585
In the purchase of property—land and buildings	900
Repairs to buildings, etc.	4,335
Construction of new buildings, and the sinking of wells	3,120
Miscellaneous purchases	1,500
Total	$16,440

It is to be noted that the borrowers received assistance in the purchase of 23 horses (9 teams included), 10 cows, 2 tractors, 2 mowers, 2 ploughs, 1 rake, and 5 sets of harness. Repairs were made to 30 houses and 2 barns; 9 houses and 3 barns were newly constructed, and 2 wells were sunk. Loans were also granted to 5 Indians for the purchase of property to enable them to become established on their respective reserves. The foregoing examples indicate the extent to which Indians have been assisted from their own funds to utilize more effectively the productive value of their lands.

A total of 148 band loans in the amount of $26,989.59 were fully retired during the fiscal year. The "revolving" feature of the loan plan is illustrated by the following table:—

Summary of Band Loan Transactions, August, 1939 to March 31, 1945

Year ended	New Loans		Loans Retired	
	No.	Amount	No.	Amount
		$ cts.		$ cts.
March 31, 1940	175	28,248 94	.....	19,412 00
March 31, 1941	170	24,795 47	.....	26,329 63
March 31, 1942	133	21,875 25	.....	34,616 99
March 31, 1943	110	17,095 90	*628	25,092 18
March 31, 1944	102	17,557 00	115	18,736 39
March 31, 1945	88	16,440 00	148	26,989 59
Totals	778	126,012 56	891	151,176 78

* Total loans retired to March 31, 1943.

The fact that moneys collected during the period exceeds the moneys advanced is explained by the fact that there was a large volume of unsecured debt owing by individuals at the beginning of the period that has been collected in part and included in above figures. Ninety-five per cent of all loans under the plan are in good standing. Under the plan 403 individual Indians are making use of over $40,000 of their Trust Funds and the number availing themselves of the privilege will increase as the Indians who have been employed in industry during the war return to their reserves and their ordinary pursuits.

SUMMARY OF INDIAN AFFAIRS BY PROVINCES AND TERRITORIES

PRINCE EDWARD ISLAND

Agency.—There is only one agency in the Province, located at Summerside. A large number of Indians live on Lennox Island, and others live at Rocky Point, near Charlottetown, Morell, St. Andrews, and Scotch Fort.

Tribal Origin.—The Indians belong to the Micmac tribe, which is of Algonkian stock.

Occupations.—Subsistence farming is engaged in by a number of Prince Edward Island Indians, with many of them owning their own live stock. During the past year outside work has been readily available with many of the Indians finding continuous employment in urban centres as well as in the lumbering and fishing industries. Basket-making, especially among the older Indians, has also been engaged in, with profitable results.

Dwellings.—The homes are fairly good and increased employment has resulted in improved living conditions generally.

NOVA SCOTIA

Agencies.—There are two Indian agencies in Nova Scotia, namely, in Hants County (Shubenacadie) and in Cape Breton County (Eskasoni).

Tribal Origin.—The Indians are of Algonkian stock and like the Indians of Prince Edward Island bear the distinctive name of Micmac.

Occupations.—While many of the Indians raise their own gardens, any other agricultural pursuits that are engaged in are on a small scale. With the progress of the war, however, more Indians are finding employment with white farmers and fruit growers. Their natural ability as guides and canoemen is utilized during the tourist season, and their skill at making baskets and at woodworking is another important source of income. They also work in lumber camps and as labourers.

Dwellings.—The houses on most of the reserves consist of one and one-half story frame dwellings, fairly well finished on the outside.

NEW BRUNSWICK

Agencies.—There are three agencies in New Brunswick; the Northeastern, at Richibucto; the Northern, at Perth; and the Southwestern, at Fredericton.

Tribal Origin.—Most of the Indians belong to the Micmac race, which is of Algonkian stock. There are also some bands of Maliseets, also of Algonkian stock.

Occupations.—Except for growing potatoes and vegetables for their own use, little farming is engaged in by the Indians of the Province of New Brunswick. The potato crop in the State of Maine, however, provides seasonal employment for many Indians every year. They also hunt and fish and act as guides. Many work in lumber camps and sawmills, and others earn a living as day labourers. In certain parts of the Province they are engaged commercially in the manufacture of axe and pick handles and baskets.

Dwellings.—Housing is similar to that in other parts of the Maritime Provinces.

QUEBEC

Agencies.—The 18 Indian agency offices in Quebec are located as follows: Amos (Abitibi), Bersimis, Cacouna (Viger), Caughnawaga, Gaspe, Gentilly (Becancour), Harrington Harbour (St. Augustine), Maniwaki, Mingan, Natashquan, Notre Dame du Nord (Timiskaming), Oka, Pierreville, Pointe Bleue, Restigouche, St. Regis, Seven Islands, Village des Hurons (Lorette).

Tribal Origin.—The principal tribes found in Quebec are: Iroquois at Caughnawaga, Lake of Two Mountains, and St. Regis; the Hurons of Lorette are also of Iroquoian stock; the Montagnais, who are of Algonkian stock, at Bersimis, Mingan, Lake St. John, Seven Islands, and other points on the north shore; the Abenakis, of Algonkian stock, at Becancour and St. Francis; the Micmacs, of Algonkian stock, at Maria and Restigouche; and the Maliseets, of Algonkian stock, at Viger. There are Crees, of Algonkian stock, in the James Bay and Abitibi Agencies; Ojibwas and Têtes de Boule of Algonkian stock in the Abitibi and Temiskaming Agencies, and Naskapis in Ungava.

Occupations.—The Indians of Caughnawaga are noted steel workers and find highly remunerative employment in that trade. The native handicraft projects organized in this province continue to prove successful. The Indians of the northern interior and the north side of the Gulf of St. Lawrence depend almost entirely on hunting, trapping, and fishing for their subsistence. In the Saguenay district they act as guides and canoemen and also find employment

in lumber camps and mills. The Indians in the organized central and southern portions engage in mixed farming. They raise fruit and dispose of it at nearby markets, and those who possess cows sell the milk to the creameries and cheese factories. A few also act as game guardians on established beaver preserves.

Dwellings.—Many of the Indians in the older settled districts own houses of stone, brick, or frame construction. In the more remote parts they live in tents during the greater part of the year. Because of increased employment housing conditions generally have improved.

ONTARIO

Agencies.—The Indian agency offices in Ontario, 24 in number, are located as follows: Brantford (Six Nations), Chapleau, Chippawa Hill (Saugeen), Christian Island, Deseronto (Tyendinaga), Fort Frances, Golden Lake, Highgate (Moravian), Kenora, Longford Mills (Rama), Manitowaning (Manitoulin Island), Moose Factory (James Bay), Muncey (Caradoc), Parry Sound, Peterborough (Rice and Mud Lakes), Port Arthur, Sarnia, Sault Ste. Marie, Scugog, Sioux Lookout, Sturgeon Falls, Virginia (Georgina and Snake Islands), Wallaceburg (Walpole Island), Wiarton (Cape Croker).

Tribal Origin.—Most of the Indians of Ontario are Ojibwas, and are of Algonkian stock. The Oneidas of the Thames, the Mohawks of the Bay of Quinte, the Mohawks of Parry Sound district, and the Six Nations of Grand River are of Iroquoian stock. There is a band of Pottawottamies at Walpole Island, and Delawares at the Caradoc (Muncey) Agency; these are of Algonkian stock. There are Crees, of Algonkian stock, in the James Bay and Sioux Lookout Agencies.

Occupations.—In northwestern Ontario the Indians are dependent largely on fishing and the trap-line for their living. In eastern Ontario they engage in lumbering. All northern reserves are reasonably well stocked with merchantable timber. In the southern and western parts of the Province farming is the chief source of revenue, although the Indians in these sections, close to industrial centres, are to a marked degree becoming absorbed into the industrial life of their respective communities. When advantageously located to do so, the Indians engage in guiding during the tourist season, in which they are particularly efficient, and in themselves actually constitute an attraction to tourists unfamiliar with the aboriginal races.

Dwellings.—As in other provinces, because of increased employment, housing conditions generally have improved. Many Indians own houses of brick, stone, or modern frame construction in the more settled districts. The Indians of the northern part of Ontario are nomadic and consequently live in tents most of the year.

MANITOBA

Agencies.—There are seven Indian agency offices in Manitoba, located as follows: Birtle, Griswold, Hodgson (Fisher River), Norway House, Portage la Prairie, Selkirk (Clandeboye), The Pas.

Tribal Origin.—Most of the Indians belong to the Ojibwa race, which is of Algonkian stock. Bands of Swampy Crees are found at the Norway House and Fisher River Agencies and in the York Factory district; these are also of Algonkian stock. The Indians located at the Griswold Agency are Sioux; there are also Sioux at the Birtle and Portage la Prairie Agencies. There is a band of Chipewyans at Churchill; this tribe is of Athapaskan stock.

Occupations.—Fishing, hunting, and trapping constitute the main sources of livelihood for the Indians inhabiting the lake regions and northern sections

of Manitoba. The large commercial fishing companies employ many Indians from the lake regions. Agriculture is confined chiefly to the Birtle, Griswold, Portage la Prairie, and Clandeboye Agencies, although Indians from other agencies work in the harvest fields in the farming communities. The new sugar beet industry is also providing work for Indians in the beet fields. Good herds of cattle, principally of the Shorthorn type, and other live stock are to be found on many reserves, and their products are a vital source of income to the Indians of southern Manitoba. Surplus hay is sold; the hay presses owned by some of the Indians enable them to ship their surplus in winter. Taking out wood for winter fuel requirements has always been an Indian occupation, while recently more and more Indians have been engaging in cutting pulpwood. Indian women find their native handicraft, particularly the manufacture and sale of gloves and moccasins, a profitable undertaking.

Dwellings.—On most of the reserves in Manitoba the houses are of log construction, one and one-half stories high with shingle roofs. They are usually white-washed every year which improve their appearance and makes for greater sanitation. There are also a number of houses of frame construction on all reserves. In the extreme north the habitations are more primitive.

SASKATCHEWAN

Agencies.—The nine Indian agency offices in Saskatchewan are located as follows: Balcarres (File Hills), Battleford, Broadview (Crooked Lake), Duck Lake, Kamsack (Pelly), Leask (Carlton), Muscow (Qu'Appelle), Onion Lake, Punnichy (Touchwood).

Tribal Origin.—The most numerous tribes among the Saskatchewan Indians are the Ojibwas, Swampy Crees, and Plains Crees, which all belong to the Algonkian stock. In addition to these, Sioux Indians are found at the Crooked Lake, Qu'Appelle, and Carlton Agencies, and on the Moose Woods Reserve. In the Onion Lake Agency there is a band of Chipewyans, who are of Athapaskan stock. There are also a few Chipewyan Indians in the Ile à la Crosse district.

Occupations.—Farming and stock-raising comprise the chief occupations of Saskatchewan Indians. They are equipped with good implements and horses and employ the same modern farming methods as their white neighbours. Their cattle are of a good type, most of them being of the Shorthorn breed. In the north central sections of the Province they supplement their incomes by selling their surplus hay and taking out fuelwood. Farther north they still depend almost entirely upon hunting, trapping, and fishing for their livelihood. They make good woodsmen. The recent shortage in the pulpwood industry has opened new opportunities for earning good money to Indians from all parts of the Province, many of them finding work in the wooded sections of Saskatchewan and several hundred going as far away as Kapuskasing, Ontario, to alleviate the acute shortage in the timber areas.

Dwellings.—On most of the reserves the Indians are fairly well housed, the homes being usually of log construction with shingle roof; others are of frame construction. In the north when the Indian is out on his hunting grounds his home consists of a log cabin with sod roof in winter, and a tent in summer.

ALBERTA

Agencies.—The ten Indian agency offices in Alberta are located as follows: Brocket (Peigan), Calgary (Sarcee), Cardston (Blood), Driftpile (Lesser Slave Lake), Fort Chipewyan (Athabaska), Gleichen (Blackfoot), Hobbema, Morley (Stony), Saddle Lake, Winterburn (Edmonton).

Tribal Origin.—The Alberta Indians are of Algonkian stock, with the exception of the Sarcees near Calgary and the Beavers and Slaves in the Lesser Slave Lake Agency, who are Athapaskan; the Paul's band in the Edmonton Agency, who are Iroquoian, and the Stonies, who are of Siouan stock. The Algonkian Indians of Alberta are subdivided into Blackfoot Nation, comprising the Indians of the Blackfoot, Blood, and Peigan Agencies; and Plains Crees found in the Lesser Slave Lake, Saddle Lake, Edmonton, and Hobbema Agencies.

Occupations.—Stock-raising is the principal occupation of the Indians of the southern and foothills regions where they have large herds of horses, and cattle herds of excellent Hereford and Shorthorn types. They grow grain on up-to-date well-equipped farms. Indians in the northern parts while mainly occupied in hunting and trapping also engage in fishing and selling fuelwood. Those Indians who do not farm for themselves find employment with farmers and ranchers; haying, harvesting, and working in the beet fields for several months during the summer. A number also work in lumber camps, sawmills, and as labourers. The Blackfoot Indians operate two coal mines of their own and obtain a substantial revenue from the sale of coal.

Dwellings.—The condition, on the whole, of the homes and farm buildings is good. Changes are gradually being made by enlarging some of the houses, or dividing large one-roomed houses into several rooms resulting in more healthful living conditions. The majority of the houses are well kept and increased employment has resulted in the purchase of additional furniture. Frame houses and barns are found on the Sarcee and Edmonton Reserves. Other houses are of log construction with shingle roofs.

BRITISH COLUMBIA

Agencies.—The Indian agency offices in British Columbia are located at 18 different points as follows: Alert Bay (Kwawkewlth), Bella Coola, Cranbrook (Kootenay), Duncan (Cowichan), Fort St. John, Hazelton (Babine), Kamloops, Lytton, Massett (Queen Charlotte Islands), Merritt (Nicola), New Westminster, Port Alberni (West Coast), Prince Rupert (Skeena), Telegraph Creek (Stikine), Vancouver, Vanderhoof (Stuart Lake), Vernon (Okanagan), Williams Lake.

Tribal Origin.—The Indians of the Bella Coola, Cowichan, Kamloops, Lytton, New Westminster, Nicola, Vancouver, and Okanagan Agencies belong to the Salish tribes. The Kootenay tribe is located in the agency of the same name. The Kwakiutl-Nootka tribe is located at the Kwawkewlth and West Coast Agencies; the Haidas, in the Queen Charlotte Islands; the Tlingits, in the Stikine; and the Tsimshians in the Skeena Agency. The Indians of the Babine, Stuart Lake, and Williams Lake Agencies belong to the Athapaskan race. The Indians of the Peace River Block are Athapaskan, with the exception of a small group of Saulteaux and Crees at Moberly Lake who are Algonkian.

Occupations.—The coast Indians exhibit skill as salmon fishermen and the fishing industry has continued to be their chief occupation. Many own their own power-boats and up-to-date equipment and either fish independently or under contract with the canneries. Herring canneries give work to a large number of Indians, especially Indian women who give excellent satisfaction as cannery workers along the coast. They also engage in clam digging, and others work at various occupations such as logging and as unskilled labourers. Indians of the central and northern interior regions make their living by trapping on registered trap-lines, and towards the south they are turning their attention more and more to agriculture and other pursuits. Many engage successfully in cattle and horse raising; others are making a success of fruit-growing, some of them having orchards of their own. Whole families participate in the seasonal migratory labour movement to pick fruit, hops, etc., which frequently takes them into the United States in their wayfaring.

Dwellings.—Special attention continues to be given to the improvement of Indian homes. All new houses are built upon modern lines of the small compact type used by white labouring classes, and greater interest is paid to ventilation, heating, and sanitation than formerly.

The best Indian houses are found on the northwest coast among the Haidas of Queen Charlotte Islands, the Tsimshians of Port Simpson, Metlakatla, and Port Essington, and Kwakiutls of Bella Bella. The gradual improvement in all farm buildings and out-buildings continues.

NORTHWEST TERRITORIES

Agencies.—The Indian Affairs Branch has three agencies in the Northwest Territories, namely, Fort Simpson, Fort Resolution, and Fort Norman.

Tribal Origin.—The principal tribes found in the far north are the Slaves, Hares, Loucheux, Sekani, Dogribs, Yellow Knives, Chipewyans, and Caribou-Eaters. All these tribes are of Athapaskan stock. The most northerly tribes are the Takudah, whose territory extends to the Mackenzie Delta; and the Copper Mines, who are located along the Coppermine River. The territory occupied by these two last-named tribes is contiguous to that inhabited by the Eskimos.

Occupations.—The Indians depend almost entirely upon hunting and trapping for a livelihood, and a few cultivate potatoes and garden vegetables. They own no cattle or horses. Large quantities of fish are caught and preserved for their own use and for dog feed during winter. Wild berries are also picked and dried for winter use.

Dwellings.—These Indians live in log cabins in winter and in tents and teepees in the summer.

YUKON TERRITORY

Tribal Origin.—The Forty-Mile, Blackstone, and Moosehide bands belong to the Takudah tribe. There is a band of Slaves at Lancing Creek who migrated from Good Hope on Mackenzie River; another band of Slaves, called Nahani, is located at the headwaters of Pelly River. All these Indians are of Athapaskan stock. At Mayo, Selkirk, Little Salmon, and Carmacks there are bands belonging to the tribe known as Stick Indians. Bands belonging to the Tlingit tribe are found at Whitehorse, Teslin Lake, Champagne Landing, and Carcross.

Occupations.—Hunting, trapping, and fishing are the chief occupations of the Yukon Indians. The women derive some revenue from the sale of moccasins and curios of various kinds, and the men are expert at making toboggans and snowshoes. Little farming is carried on owing to climatic conditions but some of the Indians cultivate patches of potatoes and other vegetables for their own use.

Dwellings.—The Indians of the Yukon live in log cabins.

TABLE 1

Census of Indians: Arranged Under Provinces and Territories, 1944

Province	Number in Band	Religion							Under 7 years		From 7 to 16 inclusive		From 17 to 21 inclusive		From 22 to 65 inclusive		From 65 years upwards	
		Anglican	Baptist	United Church	Presbyterian	Roman Catholic	Other Christian Beliefs	Aboriginal Beliefs	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Alberta	12,441	1,518	.....	1,537	.....	6,347	.....	72	1,380	1,439	1,551	1,515	581	571	2,495	2,224	309	376
British Columbia	25,515	5,831	.....	4,425	62	14,465	694	38	2,350	2,573	3,056	3,171	1,238	1,127	5,548	4,808	825	819
Manitoba	15,933	5,791	52	3,438	528	5,388	438	298	1,663	1,665	1,828	1,711	1,020	1,005	3,102	2,923	461	555
New Brunswick	2,047	.....	.....	.....	.....	2,047	.....	.....	210	202	244	238	109	105	445	414	46	34
Northwest Territories	3,816	667	.....	.....	.....	3,149	.....	.....	374	403	434	436	212	209	775	745	90	138
Nova Scotia	2,364	6	.....	.....	1	2,357	.....	.....	259	259	231	240	130	131	534	457	65	58
Ontario	32,421	10,494	1,281	5,925	307	10,338	1,147	2,929	2,630	2,739	3,189	3,351	2,094	2,101	7,283	6,904	1,042	1,088
Prince Edward Island	266	.....	.....	.....	.....	266	.....	.....	27	22	28	34	14	15	57	57	5	7
Quebec	15,194	2,932	.....	557	1	11,517	93	94	1,319	1,360	1,750	1,718	804	878	3,471	3,010	463	421
Saskatchewan	14,158	4,804	.....	1,499	163	6,934	42	716	1,572	1,611	1,683	1,646	642	639	2,828	2,779	355	403
Yukon	1,531	1,224	.....	.....	.....	307	.....	.....	147	157	180	195	74	71	331	278	54	44
Total Indian Population	125,686	33,267	1,333	17,381	1,062	63,115	2,414	4,147	11,931	12,430	14,174	14,255	6,918	6,852	26,869	24,599	3,715	3,943

TABLE No. 2

Crops Sown and Harvested, Land Broken and Summer-Fallowed, Hay Put Up, etc.

Province	Tons of Wild Hay	Acres Newly Broken	Acres Fallowed	Wheat		Oats		Other Grains		Roots and Tubers		Green Feed and Tares Hay		Total Acres under Cultivation
				Acres	Bushels	Acres	Bushels	Acres	Bushels	Acres	Bushels	Acres	Tons	
Alberta	12,454	513	18,259	12,741	128,277	10,264	321,209	2,840	43,615	228	12,524	2,797	3,260	48,979
British Columbia	8,350	233	1,510	3,049	46,697	3,157	70,425	709	12,120	3,621	233,817	24,607	42,363	37,086
Manitoba	19,650	518	3,034	2,225	56,394	3,048	104,962	2,637	61,996	680	44,973	451	770	12,593
New Brunswick	26	8	6	.....	.....	11	100	.....	.....	141½	4,850	96	55	248½
Northwest Territories	48	1	5	1	28	12	224	.....	.....	54	1,107	9	47	82
Nova Scotia	95	17	53	.....	.....	16½	415	½	11	48½	1,370	83	88	224
Ontario	1,448	392	1,384	2,715	47,934	9,661	226,095	3,199	89,110	3,591	118,231	11,043	25,610	31,684
Prince Edward Island	4	7	15	.....	.....	35	630	.....	.....	10	1,400	40	40	107
Quebec	196	65	410	39	407	1,942	25,897	142	1,336	667	16,563	3,118	5,449	6,038
Saskatchewan	27,229	1,499	14,434	11,038	221,944	12,336	314,622	3,816	60,484	535½	40,729	3,107	3,315	46,965
Yukon	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	6	.....	.....	2
Total	69,500	3,253	39,110	31,808	501,681	40,082½	1,064,579	13,343½	268,672	9,778½	475,570	45,351	80,997	184,008½

TABLE No. 3

Land: Private and Public Buildings and Property

Province	Total Area of Reserves (Acres)	Acres Under Wood	Acres Cleared but not Cultivated	Acres Under Actual Cultivation	Acres Fenced	Private Property								Public Property					
						Stone, Brick and Frame Dwellings	Other Dwellings	Outbuildings, etc.	Ploughs, Harrows, Drills, etc.	Mowers, Reapers, Binders, Threshers, etc.	Carts, Wagons and Vehicles	Automobiles	Tools and small Implements	Churches	Council Houses	School Houses	Saw Mills	Other Buildings	Engines and Machinery
Alberta	1,298,237	287,978	738,920	48,979	458,057	446	1,788	2,561	2,345	1,503	2,496	90	9,873	20	9	8	1	143	279
British Columbia	830,058	456,250	278,153	37,086	278,209	4,205	2,945	4,610	2,701	941	2,277	556	43,928	156	74	59	9	70	180
Manitoba	545,888	295,669	124,215	12,593	52,161	179	2,945	1,864	806	619	1,225	66	8,015	57	12	41	4	113	48
New Brunswick	36,963	32,740	1,124½	248½	1,087	361	7	223	41	14	24	16	1,150	6	4	11	.....	3	5
Northwest Territories	1,924	.....	37	82	82	163	210	194	3	1	3	.....	498	.....	1	.....	.....	.....	.....
Nova Scotia	18,188	2,750	31	229	795	238	16	44	26	8	21	9	675	5	3	7	3	4	6
Ontario	1,353,490	954,415	105,796	31,684	104,259	3,001	2,224	5,315	4,230	1,157	2,987	576	48,279	109	43	90	15	148	83
Prince Edward Island	2,741	520	200	107	500	30	1	14	5	6	3	.....	2	1	1	1	.....	.....	2
Quebec	199,430	62,484	13,316	6,038	14,862½	1,633	420	2,310	653	283	1,318	144	6,290	24	11	21	1	33	42
Saskatchewan	1,286,976	516,779	727,586	46,965	342,693	279	2,386	3,004	2,423	1,804	3,050	30	15,993	52	22	28	3	64	65
Yukon	6,864	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	5,580,759	2,609,585	2,039,378½	184,008½	1,251,105½	10,535	12,942	20,139	13,233	6,336	13,398	1,487	134,703	430	180	266	36	578	710

TABLE NO. 4

Live Stock and Poultry: General Effects

Province	Horses			Cattle				Sheep and Goats	Pigs	Poultry	General Effects					
	Stallions	Geldings and Mares	Foals	Bulls	Steers	Cows	Young Stock				Motor and Sail Boats	Row Boats and Canoes	Rifles and Shot Guns	Steel Traps	Nets	Tents
Prince Edward Island	.....	4	1	1	6	10	10	.....	3	300	6	6	3	12	2	.....
Nova Scotia	.....	34	.....	1	.....	55	11	.....	26	280	.....	13	113	1,135	5	21
New Brunswick	.....	18	2	1	2	12	5	.....	11	192	50	106	176	2,653	99	36
Quebec	5	572	83	82	4	1,622	790	112	726	9,033	127	1,329	2,639	29,735	885	962
Ontario	22	2,001	172	67	473	2,295	1,518	436	5,311	45,310	535	3,671	6,700	124,395	5,379	3,055
Manitoba	11	2,282	51	18	389	1,348	1,017	209	215	6,360	102	1,706	3,560	61,690	6,745	2,039
Saskatchewan	26	5,854	246	92	1,690	3,401	2,237	110	754	14,970	99	443	2,485	32,477	1,118	1,911
Alberta	135	10,722	1,613	157	4,092	6,712	4,284	451	1,878	8,530	200	536	2,244	18,762	963	2,079
British Columbia	153	8,090	1,399	296	4,876	7,348	4,075	762	1,313	44,213	1,871	3,054	8,926	88,694	2,360	1,865
Northwest Territories	2	29	4	.....	.....	2	.....	.....	.....	.....	117	709	1,482	24,070	910	546
	354	29,606	3,571	715	11,532	22,805	13,947	2,080	10,237	129,188	3,107	11,573	28,328	383,623	18,466	12,514

TABLE No. 5

Sources and Value of Income

Province	Value of Farm Products including Hay	Value of Beef Sold also of that used for food	Wages Earned	Earned by Fishing	Earned by Hunting and Trapping	Earned by other Industries and Occupations	Annuities paid and Interest on Indian Trust Funds	Total Income of Indians
	$	$	$	$	$	$	$	$
Alberta	306,936	244,902	257,764	9,996	135,032	89,394	256,613	1,300,637
British Columbia	754,373	180,915	1,818,625	1,588,838	360,035	269,350	66,588	5,038,724
Manitoba	259,583	41,585	248,500	105,312	210,900	79,125	109,436	1,054,441
New Brunswick	4,403	450	62,800	4,300	2,600	21,000	2,624	98,177
Northwest Territories	5,476	.....	19,970	14,975	471,000	5,665	19,245	536,331
Nova Scotia	7,550	475	88,800	525	900	5,500	2,512	106,262
Ontario	345,020	47,305	1,751,350	181,185	847,800	484,645	385,367	4,042,672
Prince Edward Island	2,500	500	1,200	600	1,200	5,000	.....	11,000
Quebec	128,341	20,080	977,660	3,200	310,175	109,300	24,701	1,573,457
Saskatchewan	1,208,847	102,457	342,223	19,570	97,777	219,910	150,752	2,141,536
	3,023,029	638,669	5,568,892	1,928,501	2,437,419	1,288,889	1,017,838	15,903,237

Statement of Ordinary Expenditure for Year 1944-45

—	Branch Administration	Indian Agencies	Reserves and Trusts	Medical	Grants to Hospitals	Welfare	Education	Grants to Residential Schools	Grants to Exhibitions	Total
Nova Scotia	$	$ 12,556	$ 2,296	$ 40,946	$	$ 107,566	$ 23,146	$ 28,568	$	$ 215,078
Prince Edward Island		3,624		3,862		9,763	1,028			18,277
New Brunswick	6	7,302		21,785		24,503	17,623			71,219
Quebec	52	50,703	8,322	119,983		136,738	66,058	4,879		386,735
Ontario		132,131	897	214,863		107,222	143,488	264,951	1,078	864,630
Manitoba		87,016		111,954		98,067	81,555	191,209	436	570,237
Saskatchewan	623	127,015		93,720		67,373	65,225	314,775	1,000	669,731
Alberta		110,900	10,644	86,028	1,080	63,853	13,224	339,347	596	625,672
British Columbia	920	137,460	1,440	248,132	3,240	84,227	108,324	351,917	625	936,285
Northwest Territories		21,406		91,473		14,829	1,579	42,232		171,519
Yukon		759		19,541		12,597	6,980	4,652		44,529
Headquarters and Miscellaneous	50,802	15,237	26,916	33,409		39,597	76,542		50	242,553
Indian Hospitals				388,714						388,714
Tuberculosis Control				574,050						574,050
British Columbia Special		16,218		42,500		29,903	9,580			98,201
Pensions and Gratuities		1,100		547						1,647
	52,403	723,427	50,515	2,091,507	4,320	796,238	614,352	1,542,530	3,785	5,879,077
Statutory Indian Annuities										284,563
Statutory Pensions										600
										6,164,240

Open Account—Indian Act Revolving Fund 1944-45

EXPENDITURE

Alberta	$ 1,575 84	
Saskatchewan	3 27	
		$ 1,579 11

REPAYMENTS

Alberta	$ 837 89	
British Columbia	557 91	
Saskatchewan	6,497 76	
		7,893 56
Repayments over expenditure		$ 6,314 45

Statement of Net Expenditures by Provinces, Year 1944-45

FUR CONSERVATION

Province	Amount
	$ cts.
Quebec	13,773 65
Ontario	6,527 14
Manitoba	6,734 46
Saskatchewan	27,269 60
Alberta	10,750 06
British Columbia	645 60
Head Office	2,641 06
Total	68,341 57

Indian Trust Fund

Showing transactions in connection with the fund during the fiscal year ended March 31, 1945.

—	Debit	Credit
	$ cts.	$ cts.
Balance, April 1, 1944		15,793,184 47
Collections on land sales, timber and stone dues, rents, fines, fees, etc.		1,234,034 20
Interest for the year ended March 31, 1945		800,401 42
Credit transfers during the year		11,634 05
Expenditure during the year	1,182,213 39	
Transfers by Warrant, etc.	19,389 38	
Balance March 31, 1945	16,637,651 37	
	17,839,254 14	17,839,254 14

SCHOOL STATEMENT

Statement Showing Enrolment by Provinces in the Different Classes for the Fiscal Year Ended March 31, 1945

RESIDENTIAL SCHOOLS

Province	Number of Schools	Denomination				Number on Roll			Average Attendance	Percentage of Attendance	Grades								
		Church of England	Presbyterian	Roman Catholic	United Church	Boys	Girls	Total			I	II	III	IV	V	VI	VII	VIII	IX
Nova Scotia	1	.....	.....	1	.....	76	79	155	147	94·84	42	27	19	25	15	10	7	10	.....
Quebec	2	1	.....	1	.....	16	21	37	31	83·78	22	8	5	.....	2	.....	.....	.....	.....
Ontario	13	5	1	6	1	742	848	1,590	1,415	88·99	444	211	230	215	192	115	96	64	23
Manitoba	9	1	1	4	3	491	619	1,110	994	89·55	350	149	144	157	140	90	53	18	9
Saskatchewan	14	3	.....	9	2	841	963	1,804	1,638	90·80	627	254	260	234	173	128	101	23	4
Alberta	19	5	.....	12	2	881	1,019	1,900	1,722	90·63	642	260	262	266	221	130	99	18	2
Northwest Territories	4	1	.....	3	.....	87	125	212	188	88·68	128	27	28	12	9	8	.....	.....	.....
British Columbia	13	2	.....	9	2	930	1,084	2,014	1,840	91·36	538	342	352	265	225	149	87	38	18
Yukon	1	1	.....	.....	.....	20	23	43	31	72·09	27	8	6	1	.....	1	.....	.....	.....
Total—Residential Schools	76	19	2	45	10	4,084	4,781	8,865	8,006	90·31	2,820	1,286	1,306	1,175	977	631	443	171	56

DAY SCHOOLS

Province	Number of Schools	Number on Roll			Average Attendance	Percentage of Attendance	Grades								
		Boys	Girls	Total			I	II	III	IV	V	VI	VII	VIII	IX
Prince Edward Island	1	11	12	23	11	47·83	7	7	2	3	2	.....	2	.....	.....
Nova Scotia	9	109	134	243	167	68·72	113	48	30	26	11	10	4	1	.....
New Brunswick	10	150	174	324	220	67·90	78	57	57	49	31	21	19	12	.....
Quebec	27	618	655	1,273	982	77·14	371	262	220	162	94	72	58	32	2
Ontario	75	1,058	1,151	2,209	1,596	72·25	655	367	332	257	224	160	112	89	13
Manitoba	43	534	520	1,054	599	56·83	573	197	120	80	55	18	5	6	.....
Saskatchewan	26	272	259	531	337	63·47	274	94	54	55	27	17	8	2	.....
Alberta	1	10	15	25	10	40·00	4	3	6	5	3	4	.....	.....	.....
Northwest Territories	2	11	13	24	15	62·50	6	3	5	4	1	4	.....	1	.....
British Columbia	55	800	836	1,636	1,083	66·20	741	301	242	170	83	68	28	3	.....
Yukon	6	57	81	138	72	52·17	90	27	13	2	2	.....	.....	4	.....
Total—Day Schools	255	3,630	3,850	7,480	5,092	68·07	2,912	1,366	1,081	813	533	374	236	150	15

COMBINED WHITE AND INDIAN SCHOOLS

Province	Number of Schools	Number on Roll			Average Attendance	Percentage of Attendance	Grades								
		Boys	Girls	Total			I	II	III	IV	V	VI	VII	VIII	IX
Quebec	1	7	6	13	13	100·00	3	6	3	.....	1	.....	.....	.....	.....
Ontario	2	30	23	53	43	81·13	11	9	11	4	3	7	5	3	.....
Manitoba	2	12	11	23	10	43·48	14	6	1	1	.....	.....	1	.....	.....
Saskatchewan	1	2	2	4	1	25·00	4	.....	.....	.....	.....	.....	.....	.....	.....
Total—Combined White and Indian Day Schools	6	51	42	93	67	72·04	32	21	15	5	4	7	6	3	.....

SUMMARY OF SCHOOL STATEMENT

Province	Classes of Schools			Total Number of Schools	Number on Roll			Average Attendance	Percentage of Attendance	Grades								
	Day	Residential	Combined		Boys	Girls	Total			I	II	III	IV	V	VI	VII	VIII	IX
Prince Edward Island	1	.....	.....	1	11	12	23	11	47·83	7	7	2	3	2	.....	2	.....	.....
Nova Scotia	9	1	.....	10	185	213	398	314	78·89	155	75	49	51	26	20	11	11	.....
New Brunswick	10	.....	.....	10	150	174	324	220	67·90	78	57	57	49	31	21	19	12	.....
Quebec	27	2	1	30	641	682	1,323	1,026	77·55	396	276	228	162	97	72	58	32	2
Ontario	75	13	2	90	1,830	2,022	3,852	3,054	79·28	1,110	587	573	476	419	282	213	156	36
Manitoba	43	9	2	54	1,037	1,150	2,187	1,603	73·30	937	352	265	238	195	108	59	24	9
Saskatchewan	26	14	1	41	1,115	1,224	2,339	1,976	84·49	905	348	314	289	200	145	109	25	4
Alberta	1	19	.....	20	891	1,034	1,925	1,732	89·97	646	263	268	271	224	134	99	18	2
Northwest Territories	2	4	.....	6	98	138	236	203	86·02	134	30	33	16	10	12	.....	1	.....
British Columbia	55	13	.....	68	1,730	1,920	3,650	2,923	80·08	1,279	643	594	435	308	217	115	41	18
Yukon	6	1	.....	7	77	104	181	103	56·90	117	35	19	3	2	1	.....	4	.....
Totals	255	76	6	337	7,765	8,673	16,438	13,165	80·09	5,764	2,673	2,402	1,993	1,514	1,012	685	324	71

IMMIGRATION BRANCH

A. L. JOLLIFFE, DIRECTOR

The yearly reports recording immigration activities include a number of statistical tables prepared with a view to supplying information most frequently asked for and for the purpose of comparison of immigrant movements between different years and periods. Table (1) shows the yearly totals of immigrants admitted from 1900 to 1945, and it is of interest to note the wide variation in immigrant admissions in the past forty-four years. It has been impossible to supply complete immigration figures prior to 1900 as it was only in the opening years of this century that all persons entering Canada from the United States were examined and recorded. The various tables presented each year record immigrants by country of birth, racial origin, country of previous residence, sex, age group, occupation, and destination by province.

During the fiscal year ended March 31, 1945, 15,306 immigrants entered Canada, which is an increase of 69·3 per cent over the previous year. The increase is almost entirely due to the admission to Canada from the British Isles of over 6,000 dependants of members of the Armed Forces serving overseas, which movement is referred to later in this report. A total of 10,682 immigrants entered at ocean ports and 4,624 from the United States. Their racial origins were: British 12,654, French 958, the remaining 1,694 represented 36 other racial groups. Classified by nationality 11,471 were British subjects, 3,701 United States citizens, the remaining 134 comprising 26 other nationalities. Classified by sex there were 5,092 males and 10,214 females.

Tourist Movement

Recognizing the importance of obtaining accurate statistical information regarding this important movement, several attempts have been made to classify non-immigrants entering Canada in such a manner as to differentiate between the short period visitor who resides in territory contiguous to the border, the person entering Canada on business, and the tourist. The volume of traffic at important border ports of entry is such, and the necessity for prompt clearance so important, that it has been found impossible to statistically record persons entering Canada for temporary periods under other than the general classification shown in the following tables. The figures do not mean that twenty-one million different individuals entered Canada during the year, as some persons crossed the International Boundary many times; they do record the fact that this number were individually examined by immigration officers and admitted for varying temporary periods:—

Non-Immigrants Entering Canada from Abroad

	Via Ocean Ports	From U.S.A.	Totals
Fiscal year ended March 31, 1938.....	47,832	31,179,807	31,227,639
" " " 1939.....	53,822	29,099,356	29,153,178
" " " 1940.....	42,126	28,295,332	28,337,458
" " " 1941.....	34,035	18,381,660	18,415,695
" " " 1942.....	28,395	17,983,877	18,012,272
" " " 1943.....	31,530	15,109,056	15,140,586
" " " 1944.....	24,665	16,356,484	16,381,149
" " " 1945.....	25,311	21,236,327	21,261,638

40806—13

Residents of Canada Returning After Visits Abroad

	Via Ocean Ports	From U.S.A.	Totals
Fiscal year ended March 31, 1939.....	30,446	12,098,397	12,128,843
" " " 1940.....	18,757	11,590,952	11,609,709
" " " 1941.....	10,687	5,224,356	5,235,043
" " " 1942.....	14,113	4,047,167	4,061,280
" " " 1943.....	15,294	4,394,613	4,409,907
" " " 1944.....	11,551	5,860,609	5,872,160
" " " 1945.....	13,127	8,547,051	8,560,178

It will be observed that the favourable progress of the war is reflected in the increased travel which amounts to 30 per cent over the previous year.

Returning Canadians

For the past twenty-one years the Department has recorded the number of Canadians returning to Canada with the declared intention of again taking up their permanent residence in the Dominion. This classification of "Returning Canadians" does not include persons who left Canada for a temporary purpose, and the figures in the following statement are not included in the immigration tables, in other words, returning Canadians are not counted as immigrants:—

Returning Canadians

—	Canadian Born	British Born Outside Canada	Canadians Naturalized	Totals
Fiscal year, 1934–35.....	5,811	937	870	7,618
Fiscal year, 1935–36.....	4,854	418	542	5,814
Fiscal year, 1936–37.....	4,522	319	223	5,064
Fiscal year, 1937–38.....	4,524	356	329	5,209
Fiscal year, 1938–39.....	3,825	360	386	4,571
Fiscal year, 1939–40.....	3,687	505	369	4,561
Fiscal year, 1940–41.....	4,910	177	53	5,140
Fiscal year, 1941–42.....	3,123	143	52	3,318
Fiscal year, 1942–43.....	3,056	167	30	3,253
Fiscal year, 1943–44.....	2,090	93	19	2,202
Fiscal year, 1944–45.....	2,156	130	18	2,304
Totals.....	42,558	3,605	2,891	49,054

Figures covering the years from April, 1924, to March, 1934, will be found on page 181 of the report for the year ended March, 1944.

Students

Students from many countries come to Canada to attend preparatory schools, to obtain degrees, and to take post-graduate courses in Canadian Universities. While the largest number are United States citizens, most countries of the world are well represented in Canadian educational institutes. Of the 3,523 students admitted during the year, 787 were British subjects, 2,518 United States citizens, 135 were from Central and South America, and 83 from other countries.

Regulations

The Immigration Act has not been amended since the outbreak of war but certain regulations which concern the Immigration Service have been promulgated under the authority of the War Measures Act. The most important are:—

(1) Order in Council P.C. 2653 of the 14th September, 1939, excluding persons of enemy citizenship.

(2) Order in Council P.C. 1841 of the 10th March, 1942, which prohibits women and children under the age of 16 years sailing from a Canadian port to a destination outside the Western Hemisphere without an Exit Permit issued by an official of the Immigration Branch. Such Permits may only be issued to classes specified in the Order.

(3) Order in Council P.C. 8413 of the 18th September, 1942, which provides for the cancellation of Canadian domicile and the deportation of any alien resident in Canada, who when called up for military training, claimed exemption on the ground of nationality.

(4) Order in Council P.C. 9002 of the 23rd November, 1943, authorizing the return to Canada under non-immigrant status and residence therein until six months from the termination of the war of any merchant seaman who was detained by the enemy while serving on a Canadian ship.

(5) Order in Council P.C. 9440 of the 10th December, 1943, authorizing the issuance of an Immigration Permit for the entry under temporary status of refugees transferred to Canada from the United Kingdom.

(6) Order in Council P.C. 5024 of the 30th June, 1944, authorizing the landing in Canada of a person who entered as a non-immigrant, served in the Canadian Armed Forces and honourably discharged therefrom.

(7) Orders in Council P.C. 7318 of the 21st September, 1944, and P.C. 858 of the 9th February, 1945, providing for the landing in Canada of dependants of members of the Armed Forces who have served outside Canada in the present war, and conferring upon such dependants upon admission to Canada the same immigration status as that held by the member of the Forces.

(8) Order in Council P.C. 9020 of the 30th November, 1944, provides for the landing in Canada of dependants of members of the Corps of (Civilian) Canadian Fire Fighters who have served overseas in the present war, and conferring on such dependant upon admission to Canada the same immigration status as that held by the member of the Corps.

Administration and Inspectional Work

A description of the organization through which the Immigration Branch functions will be found on page 182 of the Department's report for year ended March, 1944. During the year under review the work of the Branch has materially increased and the process of adjusting the various units of the Service to meet the requirements of necessary activities has been developing. Travel to Canada by air is rapidly increasing in volume. During the year 93,493 passengers, excluding Service personnel, entered by aeroplane at 16 ports of entry as compared with 59,824 for the year 1943-44. Facilities are being systematically extended to provide for the expeditious examination of passengers arriving by aeroplane at Canadian ports of entry.

Of the 2,862 persons rejected during the year only 454 appealed against the decision of the port officers. The number of appeals submitted to and dealt with by the Minister was 354 as compared with 432 the previous year. One hundred and eighty-one persons were deported subsequent to entering Canada; of these 45 had effected illegal entry to Canada and 88 were returned to their own country after conviction for criminal offences on completion of sentence.

Fourteen persons were prosecuted and convicted during the year for deliberate contravention of the provisions of the Immigration Act by effecting illegal entry to Canada. In each instance deportation was subsequently effected.

The regulations provide for the Masters of all vessels arriving from foreign ports to file at the Canadian port of entry a manifest recording particulars of each crew member and to report any crew changes while the vessels are in Canadian waters. By this means a methodical inspection of seamen as well as a proper control of desertions and seamen entering for hospital or other treatment is effected. A somewhat similar but modified procedure operates at Great Lake ports. During the year under review 16,807 crew manifests were filed at ocean ports recording the particulars and disposition of 367,868 seamen. The work of the shipping divisions has been particularly heavy and arduous during the war period. Many deserting seamen were apprehended and required to return to sea and all cases of sick or disabled seamen have been followed up.

The Immigration Act provides that a fine shall be levied upon any transportation company bringing to Canada any person, other than a Canadian citizen or person possessing domicile, afflicted with a mental or physical disability that might be detected by competent medical examination at the time of embarkation. Twelve such fines were assessed during the year. In two cases the fines were remitted on appeal.

The reports of 1942-43 and 1943-44 made reference to the issuance of Border Crossing Identification Cards by United States Consular officers to Canadian citizens, including all British subjects legally resident in Canada, to enable them to visit the United States without a passport. In July, 1944, the regulations were further relaxed for these classes. Such persons can now travel to the United States on business or pleasure for twenty-nine days or less without passport, visa, or Border Crossing Identification Card, on presentation of evidence of identity and Canadian status. Resulting from this change, applications for endorsement of Border Crossing Cards by Canadian Immigration Officers have diminished by 75 per cent since July, 1944.

The London, England, office reports, "Throughout the year there was a steady increase in the volume of work. Very marked is the number of inquiries regarding post-war emigration to Canada....A new phase of work developed in connection with the repatriation of Canadian civilians from countries released from enemy occupation on the Continent. After the Germans were driven out of France and Belgium, Canadian civilians began to make their way to England. Arrangements for their reception, maintenance, and repatriation were necessary, and prompt action was taken by the Canadian authorities to organize this movement. This office is responsible for all arrangements regarding reception, board and lodging, and travel in the United Kingdom from the time of arrival until the repatriates become self-supporting or sail for Canada." An indication of the increase in the volume of work in the London office is the fact that 134,940 letters and cables were received during the year as compared with 48,030 during 1943-44. Office interviews totalled 12,726 as compared with 8,987 the previous year. As the London office deals with distressed Canadians, 112 seamen requiring assistance were handled. In addition numerous seamen were interviewed and directed to channels whereby their requirements would be met.

Exit Permits

On page 183 of the report covering the year 1943-44 reference is made to the regulation controlling the sailing of women and children to destinations outside the Western Hemisphere. With the satisfactory progress of the war applications for Exit Permits steadily increased in number throughout the year. Owing to

the still present dangers of ocean travel, the shortage of passenger accommodation, and other factors, relaxation of the regulation was not warranted. A total of 5,351 Exit Permits was issued during the year. The persons to whom these permits were issued included women proceeding abroad on humanitarian work under the direction of organizations established in Canada, the dependants of R.A.F. personnel, and British families who came to Canada for temporary residence since the outbreak of war.

Repatriation of Dependants of Canadian Service Personnel

The dependants (wives, widows, and children) of members of the Canadian Armed Forces, serving abroad are provided with free transportation to destination in Canada. Subsequent to September 15, 1944, all transportation is furnished and travel arrangements made by the Department of National Defence. Free medical examination is provided by the Immigration Branch, and settlement arrangements are investigated in advance of the sailing of dependants. In October, 1944, provision was made for free transportation in favour of the dependants of members of the Corps of (Civilian) Canadian Fire Fighters who served in the United Kingdom or Europe and who married outside of Canada while so serving. A total of 6,442 dependants was admitted to Canada during the year. Dependants admitted from April 1, 1942 to March 31, 1945, totalled 7,885 of which number 5,009 were adults and 2,876 children. There are approximately 30,000 dependants still overseas.

British Evacuee Children

Under the auspices of the United Kingdom and Canadian Governments 1,532 British children between the ages of 5 and 15 were evacuated to Canada in 1940. Their placement as guests in private homes and subsequent supervision was undertaken by the Provinces through their existing child welfare organization, the expenditures being met through the National Advisory Committee for Children from Overseas from Federal grant and donations from private sources. Details of the movement of British Children and the organization set up for their supervision are recorded on pages 197-8 of the 1940-41 Annual Report. At the beginning of this fiscal year 1,412 of these children were still in Canada while at the close of the year the number was 874.

As boys and girls approached the age for military service their return to the United Kingdom was arranged if they wished to go and commencing November, 1944, the return of younger children was permitted as passage became available providing their homes were not in vulnerable areas of the United Kingdom. To date 555 have returned, 8 have been accepted as boy seamen by the Royal Navy, and 73 have enlisted in one or other of the Canadian services. Death has claimed 3 of the group. It is expected that many of the children still here will return during the next few months, although some of the older ones may remain as settlers and others may stay to finish educational courses or until joined by their parents here.

Refugees

In the report for the year 1943-44 reference is made to the authorized admission of refugee families from the Iberian Peninsula under guarantees for reception and care by Canadian organizations. A Canadian Immigration officer was temporarily located at Lisbon to grant immigration visas following medical examination and civil inspection. The movement consisted of 162 families comprising 354 adults and 92 children, and was completed during the present year. The aliens are in Canada under temporary status.

CHINESE IMMIGRATION

The present Chinese Immigration Act, which came into effect on June 30, 1923, provides for the entry to Canada of the following:—

(*a*) Members of the diplomatic corps, consuls, consular agents, and other Government representatives, their suites, and servants;

(*b*) Children born in Canada of parents of Chinese origin or descent, who left Canada for educational or other purposes, on establishing their identity to the satisfaction of the controller at the port where they seek re-entry;

(*c*) (i) Merchants, as defined by regulations made by the Minister;
(ii) Students entering Canada for the purpose of attendance, and while in actual attendance, at any Canadian university or college authorized by statute or charter to confer degrees;

(*d*) Persons in transit through Canada.

There were no immigrant admissions during the year; 46 persons entered under temporary status for varying periods and of these 25 were classified as students entering Canadian colleges and universities.

The Act provides for registration at the port of departure for Chinese leaving Canada for visits abroad, thus protecting their right to return within a period of two years from the date of registration. Regulations promulgated by Orders in Council in 1940 and 1941 extended the period of the validity of registration until the date on which the war terminates for those who register subsequent to December 1, 1938, the purpose being to prevent about 2,000 Chinese temporarily residing abroad and unable to return to Canada owing to war conditions from losing their Canadian status.

By Order in Council dated May 5, 1944, persons registering departure after that date are not restricted to one visit abroad under such registration. The same Order in Council also simplifies the requirements relating to persons entering Canada in transit or as visitors.

Many vessels arriving at Canadian ports during the war period were manned by Chinese crews and there have been very few desertions from such vessels.

The Chinese Immigration Act is administered under the direction of the Minister by the Chief Controller at Ottawa and controllers at Canadian ports of entry. The Department maintains a special staff on the Pacific Coast and until the fall of Hong Kong had a representative there dealing with Chinese matters.

For the purpose of comparison the following table relating to Chinese Immigration is furnished:—

	Exemptions	Paying Tax	Percentage of Total Arrivals Admitted Exempt	Registered for Leave	Total Revenue
					$ cts.
1923–24	49	625	7·27	5,661	334,039 00
1924–25	.....	.....	.....	5,992	308,659 00
1925–26	.....	.....	.....	3,947	25,969 00
1926–27	.....	.....	.....	5,987	14,844 00
1927–28	1	2	33·33	5,087	25,679 00
1928–29	1	.....	100·00	5,480	30,795 00
1929–30	.....	.....	.....	5,582	30,799 00
1930–31	.....	.....	.....	5,788	28,846 00
1931–32	.....	.....	.....	4,387	11,584 00
1932–33	1	.....	100·00	3,626	9,152 00
1933–34	2	.....	100·00	2,156	7,237 00
1934–35	.....	.....	.....	2,103	6,506 00
1935–36	.....	.....	.....	2,138	6,501 00
1936–37	1	.....	100·00	2,059	9,893 00
1937–38	.....	.....	.....	792	2,359 00
1938–39	.....	.....	.....	817	2,959 00
1939–40	.....	.....	.....	933	4,066 00
1940–41	.....	.....	.....	637	5,633 85
1941–42	.....	.....	.....	265	9,655 00
1942–43	.....	.....	.....	194	4,488 00
1943–44	.....	.....	.....	191	1,107 00
1944–45	.....	.....	.....	210	1,620 00
Totals	55	627	8·07	64,032	882,390 85

TABLE 1

Immigration to Canada from 1900 to 1945

		Via Ocean Ports			From U.S.A.				Grand Totals
		British Nationals	Others	Totals	U.S.A. Citizens	British Nationals	Others	Totals	
Six months ended June 30,	1900	5,141	10,211	15,352	.....	.....	.....	8,543	23,895
Fiscal year ended June 30,	1901	11,813	19,349	31,162	.....	.....	.....	17,987	49,149
" "	1902	17,270	23,721	40,991	.....	.....	.....	26,388	67,379
" "	1903	42,200	36,691	78,891	.....	.....	.....	49,473	128,364
" "	1904	51,050	34,110	85,160	12,648	4,145	23,946	40,739	125,899
" "	1905	65,967	36,756	102,723	15,477	2,263	22,190	39,930	142,653
" "	1906	88,174	43,094	131,268	33,013	2,108	17,675	52,796	184,064
Nine months ended March 31,	1907	59,272	30,736	90,008	20,479	1,309	10,369	32,157	122,165
Fiscal year ended March 31,	1908	126,783	77,374	204,157	31,411	2,674	19,067	53,152	257,309
" "	1909	55,463	31,613	87,076	33,474	2,894	17,926	54,294	141,370
" "	1910	63,757	41,239	104,996	65,190	3,662	22,196	91,048	196,044
" "	1911	126,170	63,463	189,633	77,353	5,007	22,524	104,884	294,517
" "	1912	141,504	79,023	220,527	91,840	6,236	16,250	114,326	334,853
" "	1913	152,373	111,050	263,423	92,061	7,398	19,959	119,418	382,841
" "	1914	144,513	132,835	277,348	74,745	6,374	8,773	89,892	367,240
" "	1915	44,117	40,893	85,010	34,745	3,541	3,482	41,768	126,778
" "	1916	9,032	2,568	11,600	21,370	2,796	1,687	25,853	37,453
" "	1917	9,980	4,005	13,985	43,261	3,324	4,558	51,143	65,128
" "	1918	4,879	2,881	7,760	47,818	3,444	6,923	58,185	65,945
" "	1919	10,701	6,286	16,987	28,280	1,725	1,950	31,955	48,942
" "	1920	60,659	7,021	67,680	36,628	2,250	1,850	40,728	108,408
" "	1921	75,783	24,635	100,418	33,891	2,768	1,651	38,310	138,728
" "	1922	39,606	21,048	60,654	18,782	1,825	1,063	21,670	82,324
" "	1923	36,360	14,520	50,880	14,095	1,641	830	16,566	67,446
" "	1924	78,740	49,299	128,039	14,928	1,478	805	17,211	145,250
" "	1925	54,943	40,601	95,544	13,171	1,794	853	15,818	111,362
" "	1926	37,569	39,717	77,286	15,442	2,251	1,085	18,778	96,064
" "	1927	50,378	72,586	122,964	17,820	2,239	966	21,025	143,989
" "	1928	51,552	75,041	126,593	21,260	2,696	1,051	25,007	151,600
" "	1929	59,497	77,666	137,163	26,539	3,061	960	30,560	167,723
" "	1930	64,962	67,599	132,561	26,751	3,121	855	30,727	163,288
" "	1931	28,144	35,799	63,943	20,723	2,938	619	24,280	88,223
" "	1932	7,332	4,123	11,455	12,277	1,815	205	14,297	25,752
" "	1933	3,283	3,303	6,586	11,172	1,806	218	13,196	19,782
" "	1934	2,454	3,709	6,163	6,545	1,032	163	7,740	13,903
" "	1935	2,408	3,768	6,176	5,104	769	87	5,960	12,136
" "	1936	2,264	3,718	5,982	4,322	709	90	5,121	11,103
" "	1937	2,521	4,389	6,910	4,301	742	70	5,113	12,023
" "	1938	3,351	6,651	10,002	4,727	852	64	5,643	15,645
" "	1939	3,831	7,634	11,465	4,685	917	61	5,663	17,128
" "	1940	3,962	6,495	10,457	4,383	1,234	131	5,748	16,205
" "	1941	3,428	625	4,053	5,295	2,064	84	7,443	11,496
" "	1942	2,353	201	2,554	5,075	1,180	56	6,311	8,865
" "	1943	2,524	94	2,618	3,457	1,344	26	4,827	7,445
" "	1944	4,519	80	4,599	3,302	1,101	38	4,441	9,040
" "	1945	10,564	118	10,682	3,687	907	30	4,624	15,306

TABLE 2

Immigration to Canada for the Period July 1, 1900, to March 31, 1910

	Fiscal Years										Totals
	1900–1	1901–2	1902–3	1903–4	1904–5	1905–6	Nine Months Ended March 31, 1907	1907–8	1908–9	1909–10	
English	9,331	12,783	32,087	36,003	48,847	65,135	41,156	90,380	37,019	40,416	413,157
Irish	933	1,311	2,236	3,128	3,998	5,018	3,404	6,547	3,609	3,940	34,124
Scotch	1,476	2,853	7,046	10,552	11,744	15,846	10,729	22,223	11,810	14,706	108,985
Welsh	70	312	423	691	770	797	502	1,032	463	728	5,788
Totals	11,810	17,259	41,792	50,374	65,359	86,796	55,791	120,182	52,901	59,790	562,054
African, South	.....	.....	.....	21	35	46	23	76	53	97	351
Arabian	98	70	46	58	48	19	31	50	4	14	438
Armenian	62	112	113	81	78	82	208	563	79	75	1,453
Australian	3	11	46	58	204	322	185	180	171	203	1,383
Austro-Hungarian	5,692	8,557	13,095	11,137	10,089	10,170	4,045	21,376	10,798	9,757	104,716
Brazilian	.....	.....	.....	2	1	2	5	1	4	.....	15
Bulgarian	.....	1	7	14	2	71	179	2,529	56	557	3,416
Chinese	7	2	.....	.....	.....	18	92	1,884	1,887	2,156	6,046
Doukhobor	.....	12	.....	.....	24	204	.....	.....	.....	.....	240
Dutch	25	35	223	169	281	389	394	1,212	495	741	3,964
East Indian	.....	.....	.....	.....	45	387	2,124	2,623	6	10	5,195
Egyptian	1	3	1	3	2	18	10	8	2	2	50
Finnish	682	1,292	1,734	845	1,323	1,103	1,049	1,212	669	1,457	11,366
French and Belgian	492	654	1,240	2,392	2,539	2,754	1,964	3,885	2,658	2,637	21,215
German	984	1,048	1,887	2,985	2,759	1,796	1,903	2,377	1,340	1,533	18,612
Greek	81	161	193	191	98	254	545	1,053	192	452	3,220
Hebrew	2,765	1,015	2,066	3,727	7,715	7,127	6,584	7,712	1,636	3,182	43,529
Italian	4,710	3,828	3,371	4,445	3,473	7,959	5,114	11,212	4,228	7,118	55,458
Japanese	6	.....	.....	.....	354	1,922	2,042	7,601	495	271	12,691
Malay	.....	5	.....	.....	.....	.....	.....	.....	.....	.....	5
Maltese	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	2
Mennonite	.....	52	38	11	.....	.....	.....	.....	.....	.....	101
Negro	.....	.....	.....	.....	5	42	108	136	73	7	371
Newfoundland	.....	.....	335	519	190	340	1,029	3,374	2,108	3,372	11,267
New Zealand	.....	.....	2	23	57	89	30	70	65	82	418
Persian	.....	1	40	5	8	7	31	7	1	5	105
Polish	162	230	274	669	745	725	1,033	1,593	376	1,407	7,214
Portuguese	.....	.....	.....	.....	1	6	2	2	2	2	15
Roumanian	152	551	438	619	270	396	431	949	278	293	4,377
Russian	1,044	2,467	5,505	1,955	1,887	3,152	1,927	6,281	3,547	4,564	32,329
Scandinavian	1,750	2,451	5,448	4,203	4,118	3,859	2,296	4,073	2,082	3,782	34,062
Serbian	23	.....	2	10	7	19	4	48	31	76	220
Spanish	14	1	7	5	10	12	29	61	32	42	213
Swiss	30	17	73	128	150	172	112	195	129	211	1,217
Syrian	464	1,066	847	369	630	336	277	732	189	195	5,105
Turkish	37	17	43	29	30	357	232	489	236	517	1,987
U.S.A. citizens, via ocean ports	68	73	.....	58	109	123	89	133	94	186	933
West Indian	.....	.....	23	55	77	194	90	278	159	203	1,079
Total, Continental, etc.	19,352	23,732	37,099	34,786	37,364	44,472	34,217	83,975	34,175	45,206	394,378
From the United States	17,987	26,388	49,473	40,739	39,930	52,796	32,157	53,152	54,294	91,048	457,964
Total immigration	49,149	67,379	128,364	125,899	142,653	184,064	122,165	257,309	141,370	196,044	1,414,396

TABLE 3

Immigration to Canada for the Period April 1, 1910, to March 31, 1920

	Fiscal Years										Totals
	1910–1911	1911–1912	1912–1913	1913–1914	1914–1915	1915–1916	1916–1917	1917–1918	1918–1919	1919–1920	
English	84,707	95,107	108,082	102,122	30,807	5,857	5,174	2,477	7,954	45,173	487,460
Irish	6,877	8,327	9,706	9,585	3,525	818	958	174	336	2,751	43,057
Scotch	29,924	32,988	30,735	29,128	8,346	1,887	2,062	473	1,518	10,997	148,058
Welsh	1,505	1,699	2,019	1,787	598	102	88	54	106	682	8,640
Totals	123,013	138,121	150,542	142,622	43,276	8,664	8,282	3,178	9,914	59,603	687,215
African, South	86	144	22	56	23	11	1	4	.....	23	370
Albanian	.....	.....	.....	3	4	.....	.....	.....	.....	.....	7
Arabian	3	2	10	16	.....	.....	.....	.....	.....	.....	31
Argentinian	.....	.....	.....	2	5	.....	.....	.....	.....	2	9
Armenian	20	60	100	139	36	.....	3	2	.....	10	370
Australian	266	184	106	106	51	32	18	34	35	88	920
Austro-Hungarian	16,285	21,651	21,875	28,323	7,150	15	1	.....	2	8	95,310
Belgian	1,563	1,601	1,826	2,651	1,149	172	126	19	48	1,532	10,687
Brazilian	13	.....	.....	5	.....	2	.....	.....	.....	.....	20
Bulgarian	1,068	3,295	4,616	1,727	4,048	1	.....	.....	.....	1	14,756
Chinese	5,278	6,247	7,445	5,512	1,258	88	393	769	4,333	544	31,867
Cuban	.....	.....	.....	10	1	1	3	1	.....	2	18
Doukhobor	41	24	108	4	.....	.....	.....	.....	.....	.....	177
Dutch	931	1,077	1,524	1,506	605	186	151	94	59	154	6,287
East Indian	5	3	5	88	.....	1	.....	.....	.....	.....	102
Egyptian	3	.....	7	5	.....	.....	.....	.....	.....	.....	15
Finnish	2,132	1,646	2,391	3,183	459	139	249	113	2	44	10,358
French	2,041	2,094	2,755	2,683	1,206	180	199	114	222	1,584	13,078
German	2,533	4,664	4,953	5,537	2,472	27	9	1	1	12	20,209
Greek	777	693	1,390	1,102	1,147	145	258	45	4	39	5,600
Hebrew	5,146	5,322	7,387	11,252	3,107	65	136	32	22	116	32,585
Italian	8,359	7,590	16,601	24,722	6,228	388	758	189	49	1,165	66,049
Japanese	437	765	724	856	592	401	648	883	1,178	711	7,195
Macedonian	.....	.....	.....	17	132	.....	.....	.....	.....	.....	149
Maltese	.....	.....	128	402	19	4	109	144	2	405	1,213
Mexican	.....	3	9	9	.....	.....	.....	1	3	.....	25
Montenegrin	.....	.....	36	13	9	.....	1	.....	.....	.....	59
Negro	12	138	211	266	202	34	98	35	22	61	1,079
Newfoundland	2,229	2,598	1,036	496	338	255	1,243	1,199	512	443	10,349
New Zealand	116	61	39	24	21	18	12	13	15	31	350
Persian	19	19	20	19	7	3	.....	2	2	.....	91
Polish	2,177	5,060	9,945	9,793	1,976	8	12	.....	4	76	29,051
Portuguese	13	6	9	58	8	.....	1	1	.....	3	99
Roumanian	511	793	1,116	1,504	361	4	4	.....	.....	21	4,314
Russian	6,621	9,805	18,623	24,485	5,201	40	25	42	42	51	64,935
Scandinavian—											
Danish	535	628	798	871	326	167	145	74	44	233	3,821
Icelandic	250	205	231	292	145	15	9	3	12	11	1,173
Norwegian	2,169	1,692	1,832	1,647	788	232	303	235	91	179	9,168
Swedish	3,213	2,394	2,477	2,435	916	177	332	156	101	241	12,442
Serbian	50	209	366	193	220	6	1	.....	1	12	1,058
Spanish	197	191	296	1,138	755	11	76	28	12	15	2,719
Swiss	270	230	246	269	209	42	30	12	11	100	1,419
Syrian	124	144	232	278	79	3	9	2	.....	18	889
Turkish	469	632	770	187	33	.....	5	.....	.....	1	2,097
U.S.A. citizens, via ocean ports	203	143	121	121	41	15	20	28	21	55	768
West Indian	455	393	495	719	389	47	315	307	223	66	3,409
Others	.....	.....	.....	2	18	1	.....	.....	.....	20	41
Total, Continental, etc.	66,620	82,406	112,881	134,726	41,734	2,936	5,703	4,582	7,073	8,077	466,738
From the United States	104,884	114,326	119,418	89,892	41,768	25,853	51,143	58,185	31,955	40,728	678,152
Total immigration	294,517	334,853	382,841	367,240	126,778	37,453	65,128	65,945	48,942	108,408	1,832,105

TABLE 4

Immigration to Canada for the Period April 1, 1920, to March 31, 1925

	Fiscal Years					Totals
	1920-21	1921-22	1922-23	1923-24	1924-25	
English	47,687	23,225	19,188	37,030	26,466	153,596
Irish	6,384	3,572	3,668	9,719	9,379	32,722
Scotch	19,248	11,596	11,071	25,057	16,174	83,146
Welsh	943	627	581	1,113	1,159	4,423
Totals	74,262	39,020	34,508	72,919	53,178	273,887
African, South	63	32	41	60	87	283
Albanian	6	6	1	7	2	22
Arabian	8	5	2	.....	.....	15
Argentinian	4	.....	4	.....	.....	8
Armenian	85	70	59	486	304	1,004
Australian	93	76	67	112	162	507
Austrian	26	14	23	82	75	220
Belgian	1,645	503	316	1,662	1,300	5,426
Bermudian	8	2	7	4	4	25
Brazilian	.....	.....	.....	.....	1	1
Bulgarian	4	27	19	267	69	386
Chilean	.....	.....	.....	.....	3	3
Chinese	2,435	1,746	711	674	.....	5,566
Cuban	.....	.....	.....	1	.....	1
Czecho-Slovakian	308	152	101	2,757	2,064	5,402
Dutch	595	183	119	1,149	1,637	3,683
East Indian	10	13	21	40	46	130
Egyptian	9	2	.....	3	3	17
Esthonian	.....	.....	12	51	49	112
Finnish	1,401	274	1,171	7,640	4,261	14,747
French	861	332	281	370	326	2,170
German	137	178	216	1,769	2,215	4,515
Greek	357	209	177	292	237	1,272
Hebrew	2,763	8,404	2,793	4,255	4,459	22,674
Hungarian	23	48	23	364	1,052	1,510
Italian	3,880	2,413	2,074	6,379	2,349	17,095
Jamaican	18	13	30	24	8	93
Japanese	532	471	369	448	501	2,321
Jugo-Slavian	89	180	136	1,306	1,620	3,331
Latvian	.....	.....	1	11	20	32
Lettish	.....	.....	.....	6	2	8
Lithuanian	.....	19	106	236	125	486
Luxemburg	16	5	3	85	35	144
Maltese	140	34	57	148	26	405
Mexican	1	.....	.....	1	.....	2
Negro	144	42	42	42	39	309
Newfoundland	1,042	367	1,552	5,346	1,288	9,595
New Zealand	40	25	33	50	107	255
Persian	1	9	1	5	18	34
Polish	4,061	2,707	2,921	4,211	2,734	16,634
Portuguese	4	.....	2	.....	3	9
Roumanian	969	759	427	1,431	2,056	5,642
Russian	1,077	321	222	3,058	5,411	10,089
Scandinavian—						
Danish	511	541	382	1,355	1,830	4,619
Icelandic	50	31	21	27	49	178
Norwegian	429	480	507	2,424	2,550	6,390
Swedish	715	442	948	3,536	2,138	7,779
Spanish	202	6	15	39	3	265
Swiss	235	187	152	1,585	680	2,839
Syrian	443	123	91	286	210	1,153
Turkish	8	3	3	27	29	70
Ukrainian	491	89	36	832	26	1,474
U.S.A. citizens, via ocean ports	110	67	32	134	96	439
Venezuelan	.....	.....	1	6	.....	7
West Indian	110	24	44	37	37	252
Total, Continental, etc.	26,156	21,634	16,372	55,120	42,366	161,648
From the United States	38,310	21,670	16,566	17,211	15,818	109,575
Total immigration	138,728	82,324	67,446	145,250	111,362	545,110

TABLE 5

Immigration to Canada by Origins, via Ocean Ports and from the United States,

Racial Origin	1925-26			1926-27			1927-28			1928-29		
	Via Ocean ports	From U.S.A.	Totals	Via Ocean ports	Totals U.S.A.	Totals	Via Ocean ports	From U.S.A.	Totals	Via Ocean ports	From U.S.A.	Totals
English	19,689	5,923	25,612	24,890	6,045	30,935	25,991	7,291	33,282	30,355	9,181	39,536
Irish	5,993	2,125	8,118	9,187	2,366	11,553	8,756	2,966	11,722	9,199	3,767	12,966
Scotch	10,295	2,139	12,434	14,296	2,432	16,728	14,341	2,856	17,197	16,137	3,453	19,590
Welsh	1,053	210	1,263	1,411	226	1,637	1,784	289	2,073	3,189	300	3,489
Totals	37,030	10,397	47,427	49,784	11,069	60,853	50,872	13,402	64,274	58,880	16,701	75,581
Belgian	1,063	78	1,141	2,080	69	2,149	2,171	78	2,249	1,222	79	1,301
Danish	1,112	299	1,411	2,030	225	2,255	3,835	284	4,119	3,311	351	3,662
Dutch	1,180	541	1,721	1,674	568	2,242	1,928	537	2,465	1,599	741	2,340
Finnish	1,617	63	1,680	5,180	88	5,268	4,765	112	4,877	3,651	100	3,751
French	498	1,821	2,319	548	2,499	3,047	868	3,138	4,006	745	3,934	4,679
German	7,356	2,318	9,674	12,540	2,681	15,221	12,032	3,190	15,222	12,806	3,803	16,609
Icelandic	53	22	75	30	32	62	28	18	46	24	23	47
Norwegian	1,072	800	1,872	3,384	1,255	4,639	4,327	1,330	5,657	2,434	1,419	3,853
Swedish	1,335	620	1,955	2,628	693	3,321	3,134	757	3,891	3,297	874	4,171
Swiss	320	98	418	568	101	669	614	134	748	490	156	646
Totals	15,606	6,660	22,266	30,662	8,211	38,873	33,702	9,578	43,280	29,579	11,480	41,059
Albanian	14	.....	14	17	.....	17	30	3	33	28	7	35
Arabian	10	.....	10	4	.....	4	6	1	7	1	1	2
Armenian	85	17	102	65	13	78	44	9	53	17	10	27
Austrian	75	79	154	401	129	530	606	153	759	409	100	509
Bohemian	8	63	71	22	85	107	7	67	74	8	86	94
Bulgarian	47	4	51	126	2	128	249	2	251	282	2	284
Chinese	.....	.....	.....	.....	.....	.....	3	.....	3	1	.....	1
Croatian	1,006	2	1,008	1,085	2	1,087	902	5	907	990	24	1,014
Czech	805	33	838	721	7	728	714	13	727	846	5	851
Dalmatian	1	.....	1	.....	.....	.....	.....	.....	.....	1	.....	1
East Indian	62	1	63	60	2	62	56	.....	56	52	1	53
Esthonian	28	2	30	92	.....	92	110	2	112	92	.....	92
Greek	217	41	258	340	45	385	583	72	655	736	70	806
Hebrew	3,587	427	4,014	4,471	392	4,863	4,296	470	4,766	3,301	547	3,848
Herzegovinian	.....	.....	.....	3	.....	3	4	.....	4	.....	.....	.....
Italian	1,638	138	1,776	3,301	165	3,466	3,593	190	3,783	792	272	1,064
Japanese	421	.....	421	475	.....	475	478	.....	478	445	1	446
Jugo-Slavian	1,604	23	1,627	2,084	18	2,102	1,450	19	1,469	2,824	32	2,856
Korean	.....	.....	.....	1	.....	1	.....	.....	.....	.....	.....	.....
Lettish	24	3	27	60	4	64	77	8	85	74	3	77
Lithuanian	165	23	188	842	6	848	1,037	15	1,052	1,608	18	1,626
Magyar	4,112	75	4,187	4,863	77	4,940	5,318	103	5,421	6,242	106	6,348
Maltese	21	.....	21	33	1	34	39	1	40	18	1	19
Mexican	.....	4	4	1	2	3	.....	1	1	.....	.....	.....
Montenegrin	.....	.....	.....	5	.....	5	.....	.....	.....	.....	.....	.....
Moravian	6	.....	6	36	.....	36	33	2	35	4	1	5
Negro	53	269	322	51	241	292	88	237	325	96	280	376
North American Indian	.....	7	7	.....	13	13	.....	28	28	.....	23	23
Persian	11	.....	11	6	.....	6	4	.....	4	1	.....	1
Polish	2,535	190	2,725	6,505	199	6,704	6,733	254	6,987	8,269	246	8,515
Portuguese	3	3	6	14	4	18	7	4	11	12	10	22
Roumanian	265	26	291	292	38	330	237	38	275	284	48	332
Russian	925	167	1,092	1,127	169	1,296	948	184	1,132	908	285	1,193
Ruthenian	4,259	58	4,317	9,995	66	10,061	10,128	61	10,189	15,571	39	15,610
Serbian	454	4	458	885	8	893	411	15	426	390	20	410
Slovak	2,046	23	2,069	4,274	10	4,284	3,714	20	3,734	4,303	40	4,343
Spanish	12	17	29	29	20	49	28	17	45	18	49	67
Spanish American	.....	.....	.....	6	2	8	.....	.....	.....	3	4	7
Syrian	134	22	156	218	23	241	82	31	113	75	44	119
Turkish	17	.....	17	8	2	10	4	2	6	3	4	7
Totals	24,650	1,721	26,371	42,518	1,745	44,263	42,019	2,027	44,046	48,704	2,379	51,083
Grand totals	77,286	18,778	96,064	122,964	21,025	143,989	126,593	25,007	151,600	137,163	30,560	167,723

for the Period April 1, 1925, to March 31, 1935

1929-30			1930-31			1931-32			1932-33			1933-34			1934-35		
Via Ocean ports	From U.S.A.	Totals	Via Ocean ports	From U.S.A.	Totals	Via Ocean ports	From U.S.A.	Totals	Via Ocean ports	From U.S.A.	Totals	Via Ocean ports	From U.S.A.	Totals	Via Ocean ports	From U.S.A.	Totals
32,278	9,379	41,657	14,662	7,498	22,160	4,275	4,525	8,800	1,940	4,153	6,093	1,375	2,623	3,998	1,380	2,053	3,433
10,159	3,762	13,921	4,233	2,904	7,137	791	1,716	2,507	323	1,512	1,835	283	905	1,188	291	727	1,018
18,640	3,638	22,278	7,872	2,917	10,789	1,843	1,732	3,575	764	1,747	2,511	547	1,038	1,585	472	734	1,206
3,005	332	3,337	817	231	1,048	179	147	326	70	92	162	55	77	132	55	55	110
64,082	17,111	81,193	27,584	13,550	41,134	7,088	8,120	15,208	3,097	7,504	10,601	2,260	4,643	6,903	2,198	3,569	5,767
696	92	788	255	105	360	47	31	78	37	42	79	41	23	64	61	18	79
2,685	319	3,004	820	184	1,004	53	87	140	55	53	108	43	47	90	21	28	49
1,755	703	2,458	344	444	788	33	236	269	33	226	259	27	137	164	44	104	148
4,565	82	4,647	2,297	57	2,354	92	38	130	30	29	59	51	16	67	59	21	80
697	4,419	5,116	347	4,391	4,738	87	2,734	2,821	88	2,702	2,790	74	1,130	1,204	86	809	895
14,281	3,733	18,014	7,724	2,673	10,397	727	1,532	2,259	518	1,180	1,698	401	755	1,156	301	656	957
6	28	34	25	17	42	.....	10	10	1	6	7	.....	10	10	1	12	13
2,256	1,149	3,405	740	645	1,385	70	171	241	44	218	262	31	108	139	37	93	130
2,918	736	3,654	730	366	1,096	79	195	274	17	165	182	19	110	129	10	83	93
473	117	590	211	83	294	24	28	52	17	41	58	19	30	49	22	21	43
30,332	11,378	41,710	13,493	8,965	22,458	1,212	5,062	6,274	840	4,662	5,502	706	2,366	3,072	642	1,845	2,487
26	1	27	25	1	26	5	.....	5	.....	.....	.....	1	.....	1	3	.....	3
7	2	9	2	.....	2	.....	.....	.....	2	.....	2	.....	.....	.....	1	.....	1
14	16	30	21	1	22	4	1	5	1	4	5	7	3	10	1	4	5
437	75	512	116	68	184	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
20	81	101	11	57	68	.....	21	21	7	16	23	.....	10	10	.....	9	9
296	10	306	295	.....	295	15	3	18	3	5	8	12	2	14	5	.....	5
.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	1	2	.....	2	.....	.....	.....
771	11	782	482	2	484	106	5	111	96	4	100	108	6	114	155	.....	155
434	14	448	225	8	233	69	9	78	65	7	72	52	7	59	77	4	81
7	.....	7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
58	.....	58	80	.....	80	47	.....	47	62	1	63	33	.....	33	33	.....	33
117	2	119	63	2	65	6	1	7	.....	1	1	2	2	4	2	.....	2
634	48	682	388	48	436	20	43	63	37	32	69	34	26	60	35	17	52
3,544	620	4,164	2,908	513	3,421	202	447	649	346	426	772	599	344	943	335	289	624
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1,277	236	1,513	1,007	228	1,235	414	166	580	255	142	397	267	109	376	325	56	381
194	.....	194	204	1	205	195	.....	195	115	.....	115	104	1	105	93	.....	93
921	35	956	364	27	391	57	9	66	56	11	67	63	3	66	120	2	122
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
70	8	78	28	1	29	4	2	6	.....	4	4	4	.....	4	.....	.....	.....
964	22	986	466	11	477	45	5	50	57	6	63	37	2	39	37	5	42
5,688	99	5,787	2,401	71	2,472	397	41	438	364	20	384	509	18	527	362	20	382
40	1	41	13	6	19	5	.....	5	2	4	6	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	1	1	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	2	2	3	.....	3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
23	.....	23	2	.....	2	.....	1	1	3	.....	3	.....	.....	.....	.....	.....	.....
195	251	446	120	158	278	15	83	98	9	60	69	19	57	76	5	16	21
.....	22	22	.....	8	8	.....	34	34	.....	20	20	.....	8	8	.....	6	6
1	.....	1	2	.....	2	.....	.....	.....	1	.....	1	.....	.....	.....	.....	.....	.....
6,610	227	6,837	3,997	226	4,223	554	103	657	360	99	459	374	50	424	406	40	446
13	11	24	5	10	15	2	2	4	1	6	7	2	4	6	2	3	5
383	62	445	179	44	223	22	15	37	26	11	37	27	7	34	52	5	57
765	173	938	879	97	976	74	32	106	62	35	97	61	16	77	60	25	85
11,291	41	11,332	6,413	78	6,491	502	38	540	414	47	461	421	8	429	586	15	601
375	29	404	140	18	158	31	16	47	26	18	44	37	10	47	26	3	29
2,879	46	2,925	1,957	32	1,989	337	9	346	252	8	260	395	6	401	595	12	607
26	37	63	8	26	34	9	11	20	7	16	23	7	6	13	7	7	14
.....	4	4	1	1	2	2	.....	2	.....	1	1	4	.....	4	.....	.....	.....
61	51	112	54	22	76	15	16	31	19	26	45	14	26	40	13	7	20
6	1	7	7	.....	7	1	1	2	.....	.....	.....	2	.....	2	.....	1	1
38,147	2,238	40,385	22,866	1,765	24,631	3,155	1,115	4,270	2,649	1,030	3,679	3,197	731	3,928	3,336	546	3,882
132,561	30,727	163,288	63,943	24,280	88,223	11,455	14,297	25,752	6,586	13,196	19,782	6,163	7,740	13,903	6,176	5,960	12,136

TABLE 6

Immigration to Canada, by Origins, via Ocean Ports and from the United States,

Racial Origin	1935-36			1936-37			1937-38			1938-39			1939-40		
	Via Ocean Ports	From U.S.A.	Totals	Via Ocean Ports	From U.S.A.	Totals	Via Ocean Ports	From U.S.A.	Totals	Via Ocean Ports	From U.S.A.	Totals	Via Ocean Ports	From U.S.A.	Totals
English	1,286	1,744	3,030	1,445	1,738	3,183	1,949	1,870	3,819	2,247	1,824	4,071	2,489	1,878	4,367
Irish	249	626	875	262	617	879	364	686	1,050	387	726	1,113	375	710	1,085
Scotch	484	677	1,161	519	639	1,158	604	737	1,341	665	707	1,372	643	702	1,345
Welsh	30	56	86	38	69	107	55	48	103	74	60	134	59	75	134
Totals	2,049	3,103	5,152	2,264	3,063	5,327	2,972	3,341	6,313	3,373	3,317	6,690	3,566	3,365	6,931
Belgian	72	9	81	93	13	106	123	22	145	187	15	202	100	23	123
Danish	21	33	54	22	44	66	40	43	83	49	34	83	71	39	110
Dutch	111	97	208	90	102	192	119	113	232	237	139	376	264	147	411
Finnish	43	24	67	49	16	65	79	14	93	58	14	72	57	20	77
French	95	724	819	135	711	846	134	774	908	138	860	998	152	794	946
German	209	471	680	367	529	896	523	571	1,094	586	507	1,093	1,021	510	1,531
Icelandic	6	6	12	.....	2	2	3	5	8	.....	8	8	.....	4	4
Norwegian	31	94	125	25	74	99	27	91	118	21	84	105	40	89	129
Swedish	26	89	115	16	73	89	47	95	142	15	90	105	13	80	93
Swiss	32	18	50	49	16	65	87	18	105	75	22	97	49	32	81
Totals	646	1,565	2,211	846	1,580	2,426	1,182	1,746	2,928	1,366	1,773	3,139	1,767	1,738	3,505
Albanian	1	.....	1	4	.....	4	8	1	9	10	.....	10	4	.....	4
Arabian	.....	2	2	.....	.....	.....	4	.....	4	4	2	6	.....	.....	.....
Armenian	4	1	5	3	1	4	4	3	7	5	1	6	2	1	3
Bohemian	1	6	7	1	13	14	5	6	11	2	10	12	332	9	341
Bulgarian	22	2	24	18	1	19	28	2	30	29	.....	29	15	.....	15
Chinese	.....	.....	.....	1	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....
Croatian	157	.....	157	240	.....	240	277	4	281	265	3	268	106	2	108
Czech	106	1	107	134	4	138	188	3	191	169	4	173	290	3	293
Dalmatian	.....	.....	.....	1	.....	1	.....	.....	.....	1	.....	1	.....	.....	.....
East Indian	20	1	21	13	.....	13	14	.....	14	14	.....	14	11	.....	11
Esthonian	2	.....	2	5	.....	5	2	1	3	12	.....	12	3	1	4
Greek	53	19	72	75	20	95	115	11	126	127	10	137	115	10	125
Hebrew	655	225	880	391	228	619	317	267	584	621	269	890	1,321	302	1,623
Italian	341	49	390	299	58	357	408	69	477	365	58	423	186	64	250
Japanese	83	.....	83	103	.....	103	139	.....	139	46	.....	46	36	.....	36
Jugo-Slavian	106	3	109	106	3	109	116	9	125	250	3	253	55	6	61
Lettish	3	.....	3	2	3	5	11	.....	11	4	.....	4	3	2	5
Lithuanian	22	3	25	42	10	52	37	6	43	39	6	45	49	5	54
Magyar	314	22	336	328	11	339	622	24	646	532	22	554	329	37	366
Maltese	.....	.....	.....	4	1	5	2	.....	2	1	5	6	.....	.....	.....
Mexican	.....	1	1	6	.....	6	1	.....	1	2	.....	2	.....	.....	.....
Montenegrin	.....	.....	.....	.....	.....	.....	2	.....	2	8	.....	8	.....	.....	.....
Moravian	.....	.....	.....	.....	.....	.....	3	.....	3	9	.....	9	52	.....	52
Negro	3	20	23	5	17	22	9	17	26	7	24	31	7	22	29
North American Indian	.....	2	2	.....	2	2	.....	11	11	.....	13	13	.....	4	4
Persian	.....	.....	.....	1	.....	1	2	1	3	.....	.....	.....	1	.....	1
Polish	362	42	404	432	35	467	615	46	661	586	68	654	297	51	348
Portuguese	4	3	7	2	.....	2	1	2	3	1	2	3	1	3	4
Roumanian	33	4	37	65	2	67	77	11	88	102	2	104	20	8	28
Russian	84	13	97	79	19	98	120	22	142	134	14	148	134	47	181
Ruthenian	418	8	426	855	15	870	1,356	13	1,369	1,837	19	1,856	1,509	16	1,525
Serbian	29	.....	29	35	3	38	83	4	87	70	5	75	17	4	21
Slovak	432	11	443	520	7	527	1,249	13	1,262	1,450	19	1,469	206	22	228
Spanish	6	5	11	10	11	21	14	2	16	6	4	10	9	10	19
Spanish American	.....	.....	.....	.....	1	1	3	.....	3	.....	.....	.....	.....	1	1
Syrian	26	10	36	19	5	24	15	8	23	18	10	28	14	15	29
Turkish	.....	.....	.....	1	.....	1	1	.....	1	.....	.....	.....	.....	.....	.....
Totals	3,287	453	3,740	3,800	470	4,270	5,848	556	6,404	6,726	573	7,299	5,124	645	5,769
Grand Totals	5,982	5,121	11,103	6,910	5,113	12,023	10,002	5,643	15,645	11,465	5,663	17,128	10,457	5,748	16,205

for the Period April 1, 1935, to March 31, 1945

1940-41			1941-42			1942-43			1943-44			1944-45		
Via Ocean Ports	From U.S.A.	Total	Via Ocean Ports	From U.S.A.	Totals	Via Ocean Ports	From U.S.A.	Totals	Via Ocean Ports	From U.S.A.	Totals	Via Ocean Ports	From U.S.A.	Totals
2,408	2,841	5,249	1,852	2,234	4,086	1,992	1,703	3,695	3,470	1,491	4,961	8,178	1,574	9,752
235	953	1,188	122	926	1,048	170	592	762	352	610	962	652	540	1,192
406	1,013	1,419	179	888	1,067	230	718	948	411	580	991	989	549	1,538
55	91	146	29	88	117	26	62	88	45	43	88	124	48	172
3,104	4,898	8,002	2,182	4,136	6,318	2,418	3,075	5,493	4,278	2,724	7,002	9,943	2,711	12,654
30	20	50	10	17	27	.....	11	11	6	9	15	13	8	21
22	63	85	4	42	46	3	22	25	9	28	37	12	36	48
51	187	238	11	192	203	10	136	146	8	123	131	28	131	159
2	30	32	1	18	19	.....	22	22	.....	15	15	2	10	12
129	849	978	104	632	736	69	580	649	149	586	735	305	653	958
39	359	398	23	371	394	15	256	271	11	302	313	55	312	367
.....	4	4	.....	5	5	1	4	5	1	4	5	1	6	7
21	79	100	14	96	110	19	84	103	12	51	63	13	55	68
6	117	123	1	72	73	6	53	59	3	53	56	6	91	97
12	42	54	15	36	51	3	18	21	4	10	14	9	13	22
312	1,750	2,062	183	1,481	1,664	126	1,186	1,312	203	1,181	1,384	444	1,315	1,759
.....	.....	.....	.....	.....	.....	.....	1	1	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
2	3	5	.....	.....	.....	1	4	5	.....	2	2	1	2	3
3	12	15	.....	11	11	.....	6	6	.....	7	7	1	3	4
1	1	2	.....	.....	.....	.....	.....	.....	.....	2	2	.....	2	2
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
7	6	13	.....	3	3	1	2	3	2	3	5	.....	1	1
49	18	67	17	10	27	6	2	8	8	4	12	18	9	27
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
6	.....	6	3	.....	3	.....	.....	.....	.....	.....	.....	.....	.....	.....
1	.....	1	1	.....	1	1	.....	1	2	.....	2	2	.....	2
26	20	46	3	27	30	1	14	15	1	11	12	3	15	18
284	342	626	111	277	388	31	239	270	56	182	238	93	237	330
43	85	128	1	66	67	.....	43	43	3	81	84	26	51	77
44	1	45	1	.....	1	.....	1	1	.....	.....	.....	.....	.....	.....
1	6	7	.....	5	5	.....	3	3	.....	6	6	1	10	11
1	6	7	.....	2	2	1	2	3	1	.....	1	1	1	2
6	8	14	.....	4	4	1	4	5	4	5	9	3	7	10
35	21	56	4	29	33	.....	27	27	3	26	29	19	24	43
.....	4	4	1	.....	1	.....	1	1	1	.....	1	1	.....	1
.....	.....	.....	.....	2	2	.....	1	1	1	.....	1	1	.....	1
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
2	.....	2	.....	.....	.....	.....	.....	.....	1	.....	1	.....	.....	.....
45	30	75	13	31	44	5	53	58	5	24	29	23	42	65
.....	16	16	.....	15	15	.....	6	6	.....	16	16	2	21	23
.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	1	.....	.....	.....
25	100	125	5	102	107	5	71	76	7	63	70	43	76	119
4	2	6	5	4	9	3	2	5	3	.....	3	6	2	8
6	4	10	2	5	7	.....	3	3	3	8	11	2	4	6
9	31	40	11	35	46	6	22	28	4	19	23	9	42	51
3	19	22	.....	19	19	.....	15	15	.....	30	30	14	17	31
7	5	12	.....	9	9	.....	5	5	.....	4	4	1	3	4
5	23	28	2	20	22	4	19	23	1	21	22	.....	7	7
19	14	33	5	7	12	2	5	7	8	2	10	12	3	15
2	2	4	2	4	6	5	2	7	2	1	3	6	4	10
1	16	17	2	7	9	.....	13	13	1	19	20	7	15	22
.....	.....	.....	.....	.....	.....	1	.....	1	.....	.....	.....	.....	.....	.....
637	795	1,432	189	694	883	74	566	640	118	536	654	295	598	893
4,053	7,443	11,496	2,554	6,311	8,865	2,618	4,827	7,445	4,599	4,441	9,040	10,682	4,624	15,306

TABLE 7

Immigration via Ocean Ports Showing Country of Birth by Racial Origin, for the Fiscal Year 1944-45

Country of Birth	Totals	Bohemian	Hebrew	English	Irish	Scotch	Welsh	N.A. Indian	Mexican	Spanish American	Serbian	Belgian	Czech	Finnish	French	German	Greek	Dutch	Magyar	Italian	Jugo-Slavian	Polish	Roumanian	Russian	Danish	Icelandic	Norwegian	Swedish	Swiss	Ruthenian	Esthonian	Lettish	Lithuanian	Maltese	Portuguese	Spanish	Negro	Armenian	Syrian
Africa (British)	25			17		2	1											2				1						2										
Africa (not British)	6			3		3																																
At Sea	1																					1																
Atlantic Ocean Is. (Br.)	4			4																																		
Australia	11			5	3	2																	1															
Austria	15		5										1			9																						
Barbados	16			6		1																														9		
Bahamas	9			7		1						1																										
Belgium	26			15								7			1					3																		
Bermuda	25			16		2									5																						2		
Brazil	7			4		1																						1		1								
Canada	1														1																							
Chile	6			5																1																		
China	17		2	8	1	3									1								2															
Cuba	8														1			2																		4	1	
Czecho-Slovakia	14	1											12			1																						
Denmark	3																							3														
Ecuador	1			1																																		
Egypt	9			4											4																		1					
Eire	147			11	131	2									3																							
England	5,513		51	4,912	93	170	19					3	4	2	141	21	1	17	8	16		21		3	8	1	5	3	1	6			2			4		1
Esthonia	3																							1							2							
France	13			2											11																							
Germany	20		8													12																						
Greece	1																1																					
Guatemala	9			6		1				1					1																							
Guiana, British	16			8	2	1							1		1																				1		2		
Holland	1																	1																				
Honduras (British)	2							1		1																												
Hong Kong	1			1																																	
Hungary	11		2																9																		
India	49			33	3	11									1		1																					
Ireland (Northern)	48			7	35	5												1																				
Italy	4			1		1														2																		
Jamaica	41			26	2	4									3	1		1																		3		1
Japan	1			1																																		
Jugo-Slavia	8		6								1										1																	
Labrador	1			1																																		
Latvia	4		2	1																											1							

Lesser British Isles	17			17																																			
Lithuania	2		1																		[illegible]																		
Malta	2			2																																			
Mexico	2					1			1																														
Newfoundland	3,357			2,796	340	89	5	1				2			104	7		2		2		[illegible]		1	1		3		1	1									
New Zealand	20			17		3																																	
Norway	1																										1												
Palestine	1				1																																		
Peru	3			2						1																													
Philippine Islands	1			1																																			
Poland	28		9													1						16								2									
Portugal	1			1																																			
Roumania	4		2												1								1																
Russia	4		2																			1		1															
St. Pierre and Miquelon	3														3																								
Scotland	809		2	88	27	667	3								15	2		1						1						1			1					1	
South America, N.E.S	9			6		1				1								1																					
Spain	3		1			1																														1			
Straits Settlements	1			1																																			
Sweden	3																										1	2											
Switzerland	8														1					2									5										
Syria	5																																						5
Trinidad	30			20	1	2	1								2																					3	1		
Turkey	1														1																								
Ukraine	3																													3									
United States	56			39	5	6				1					1	1			1								2												
Venezuela	1			1																																			
Wales	177			65	6	7	95								2				1								1												
West Indies (Br.)	32			16	2	2				1					1																				5		5		
Not shown	1			1																																			
Totals	10.682	1	93	8.178	652	989	124	2	1	6	1	13	18	2	305	55	3	28	19	26	1	43	2	9	12	1	13	6	9	14	2	1	3	1	6	12	23	1	7

TABLE 8

Immigration from the United States, Showing Country of Birth by Racial Origin, for the Fiscal Year 1944-45

Country of Birth	Totals	Bohemian	Slovakian	Hebrew	English	Irish	Scotch	Welsh	N.A. Indian	Spanish American	Croatian	Serbian	Belgian	Bulgarian	Czech	Finnish	French	German	Greek	Dutch	Magyar	Italian	Jugo-Slavian	Polish	Roumanian	Russian	Danish	Icelandic	Norwegian	Swedish	Swiss	Ruthenian	Lettish	Lithuanian	Portuguese	Spanish	Negro	Armenian	Syrian
Africa (British)	1					1																																
Africa (not British)	1					1																																
Argentine	2					2																																
Australia	1						1																															
Austria	9			2														6					1															
Barbados	2																																			2		
Belgium	4												4																									
Brazil	1																																		1			
Canada	576	1		13	209	93	103	3								1	114	15		8			4		3	2	1	1			1					2		
Chile	2				1		1																															2
China	3				3																																	
Cuba	2				1					1																												
Czecho-Slovakia	8		3	1											3			1																				
Denmark	3																										3											
Eire	16					14	1								1																							
England	241			4	225	4	4	2									1													1								
Finland	3															2													1									
France	18			2	1												14				1																	
Germany	21			5														13						1			2										
Greece	7																		7																			
Guatemala	1																1																					
Guiana, British	1						1																															
Hawaiian Islands	2			2																																		
Holland	6																			6																		
Hungary	10			1	1																8																	
Iceland	1																											1										
India	2				1																									1								
Ireland (Northern)	28				1	24	3																															
Italy	6																					6																
Jamaica	2				2																																	
Jugo-Slavia	3										1												2															
Latvia	1			1																																		
Lesser British Isles	1				1																																	
Newfoundland	26				21	4																							5	1								
Norway	5																	1						9		1					1							
Poland	31			19																	1				1													
Roumania	8			5								1																											

Russia	38	...	...	20	...	...	...	...	...	...	...	...	...	...	...	...	...	7	...	1	...	...	...	...	...	9	...	...	...	...	...	1	...	...	...	...	...	...	...
Scotland	80	...	...	1	2	3	73	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...
Spain	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...
Sweden	24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	24	...	...	...	...	...	...	...	...	...
Switzerland	4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	3	...	...	...	...	...	...	...	...
Syria	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Turkey	1	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Ukraine	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...
United States	3,410	2	4	161	1,099	397	362	37	21	3	...	2	4	2	5	7	522	269	8	116	14	44	7	62	3	29	29	4	49	63	10	13	1	6	2	1	38	2	12
Wales	9	...	...	...	1	1	...	6	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Totals	4,624	3	7	237	1,574	540	549	48	21	4	1	3	8	2	9	10	653	312	15	131	24	51	10	76	4	42	36	6	55	91	13	17	1	7	2	3	42	2	15

TABLE

Origin, Sex, Occupation, and Destination of Immigrant Arrivals

Racial Origin	Sex				Totals	Trade or								
	18 Years and Over		Under 18 Years			Farming Class			Labouring Class			Mechanics		
	Males	Females	Males	Females		Males	Females	Children	Males	Females	Children	Males	Females	Children
Armenian				1	1									
Belgian	3	6	1	3	13							1		
Bohemian		1			1									
British—														
English	1,098	4,339	1,355	1,386	8,178	17	8	6	450	83	65	324	69	72
Irish	133	353	83	83	652				53	9	1	43	8	6
Scotch	61	579	164	185	989	1	1		11	2		16	3	3
Welsh	6	95	12	11	124				1		1	3		
Czech	7	6	2	3	18	1						2	2	1
Dutch	3	4	13	8	28	1						1		
Esthonian	2				2	1						1		
Finnish			2		2									
French	34	52	117	102	305	1			12	2	1	9		
German	6	19	11	19	55				1	1		2		
Greek	1	1		1	3				1					
Hebrew	20	52	11	10	93	2	1	1				4		
Italian	2	10	4	10	26						1	1		
Jugo-Slavian	1				1									
Lettish	1				1	1								
Lithuanian		2		1	3									
Magyar		10	6	3	19									
Maltese		1			1									
Mexican		1			1								1	
Negro	15	8			23				7	1		5		
North American Indian	1	1			2				1					
Polish	6	15	12	10	43	2	1	1		2		2		
Portuguese		1	3	2	6									
Roumanian		1	1		2									
Russian	1	5	1	2	9									
Ruthenian	3	1	4	6	14				1					
Scandinavian—														
Danish	2	4	4	2	12				1					
Icelandic				1	1									
Norwegian	3	4	5	1	13							1		
Swedish	1	1	1	3	6									
Serbian		1			1									
Spanish	5	6		1	12				1			2	1	
Spanish American	3	3			6				1					
Swiss	2	5	2		9	1								
Syrian	3	2	1	1	7									
Totals	1,423	5,589	1,815	1,855	10,682	28	11	8	541	100	69	417	84	82

9

at Ocean Ports, for the Fiscal Year ended March 31, 1945

Occupation											Destination										
Trading and Clerical Classes			Mining Class			Female Domestic Servants		Other Classes													
Males	Females	Children	Males	Females	Children	18 Years and Over	Under 18 Years	Males	Females	Children	Nova Scotia	New Brunswick	Prince Edward Island	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Yukon Territory	Northwest Territories
										1					1						
	2							2	4	4	1			6	1	3		1	1		
									1			1									
119	159	58	71	1		286	67	117	3,733	2,473	1,626	333	38	1,091	3,239	399	395	414	642		1
11	22	1	5	1	1	30	1	21	283	156	184	44	7	94	210	19	21	31	42		
11	14	5		1		8	1	22	550	340	88	48	1	125	394	69	63	83	118		
1	2							1	93	22	8	6	1	19	51	10	5	12	12		
4									4	4				1	12			3	2		
								1	4	21	1			1	19	1	1	3	2		
												1							1		
										2					1				1		
2	6	1				10	3	10	34	214	56	19		134	72	2	7	9	6		
	1							3	17	30	2	1		10	22	2	6	2	10		
									1	1					3						
10	8	2						4	43	18	1			45	30	8	2	1	6		
1	1	2							9	11	3	1		10	8	1			3		
								1											1		
														1							
									2	1					2				1		
									10	9				1	13		1	1	3		
									1		1										
															1						
1								2	7		1			18	3				1		
						1									2						
1								1	12	21	1			14	13	8	1	4	2		
									1	5				5					1		
									1	1				1					1		
								1	5	3		1		1	4	1		1	1		
								2	1	10				1	7	4	2				
								1	4	6		1		1	7	1	1		1		
										1						1					
1								1	4	6	1			4	2	1	2	2	1		
			1						1	4	1	1							4		
	1																			1	
1	1							1	4	1				1	7		1	1	2		
1								1	3		2			2	2						
1									5	2				1	4			3	1		
2								1	2	2	1		1	2	3						
167	217	69	77	3	1	335	72	193	4,839	3,369	1,978	457	48	1,589	4,133	530	508	571	866	1	1

TABLE

Origin, Sex, Occupation, and Destination of Immigrant Arrivals

Racial Origin	Sex				Totals	Trade or								
	18 Years and Over		Under 18 Years			Farming Class			Labouring Class			Mechanics		
	Males	Females	Males	Females		Males	Females	Children	Males	Females	Children	Males	Females	Children
Armenian		2			2									
Belgian		7	1		8		1							
Bohemian		3			3								1	
British—														
English	436	699	220	219	1,574	85	44	36	39	19	12	82	15	31
Irish	116	279	73	72	540	20	13	7	6	11	6	30	12	7
Scotch	160	238	80	71	549	34	16	17	12	6	5	27	7	7
Welsh	19	14	8	7	48	2			2			5		
Bulgarian				2	2									
Croatian	1				1									
Czech	4	4		1	9									
Dutch	36	55	20	20	131	13	6	11	3	1	3	3	2	3
Finnish	2	7		1	10	1	2							
French	170	296	87	100	653	43	12	14	25	10	17	29	11	8
German	76	159	36	41	312	13	11	10	4	3	2	7	2	3
Greek	5	6	2	2	15				1			1		
Hebrew	58	115	30	34	237				2	2		6	4	3
Italian	10	24	11	6	51				2	2	4	4	1	2
Jugo-Slavian	1	8	1		10	1								
Lettish	1				1									
Lithuanian	1	4	1	1	7									
Magyar	5	13	3	3	24	2						1	1	
Negro	14	16	7	5	42	3	2	1	2		1	3	1	
North American Indian	1	3	8	9	21	1		3						
Polish	13	40	13	10	76	1					1	1	1	
Portuguese		2			2									
Roumanian		1	1	2	4									
Russian	11	24	5	2	42	3	2	1	3	1		1	1	3
Ruthenian	4	1	6	6	17			4			1	1		
Scandinavian—														
Danish	9	16	9	2	36				2			1	1	
Icelandic		4	1	1	6									
Norwegian	16	34	2	3	55	7				1		1	2	
Swedish	25	35	21	10	91	8	5	9	2	1		4	3	2
Serbian	1	2			3	1	1							
Slovak	2	5			7									
Spanish	1	2			3									
Spanish American	1	2		1	4									
Swiss	3	9		1	13							1		
Syrian	3	7	3	2	15		2	1	1		1			
Totals	1,205	2,136	649	634	4,624	238	117	114	106	57	53	208	65	69

10

from the United States, for the Fiscal Year ended March 31, 1945

Occupation											Destination										
Trading and Clerical Classes			Mining Class			Female Domestic Servants		Other Classes													
Males	Females	Children	Males	Females	Children	18 Years and Over	Under 18 Years	Males	Females	Children	Nova Scotia	New Brunswick	Prince Edward Island	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Yukon Territory	Northwest Territories
									2						2						
	2	1				1			3					1	4	1	1		1		
									2						2	1					
81	67	45	3			8	1	146	546	314	121	115	15	168	785	51	25	67	246		1
24	30	9	1			1		35	212	116	36	31	3	48	299	12	19	30	62		
33	29	12	1			3		53	177	110	72	29	8	50	256	12	15	19	87	1	
4	3							6	11	15		2		3	31			1	11		
		1								1					2						
								1							1						
	1							4	3	1	1			4	2	1			1		
2	6	2				1		15	39	21	7	5		5	57	6	7	19	25		
								1	5	1				1	8		1				
22	21	5				7		51	235	143	22	49	4	368	167	6	6	9	21	1	
15	19	6	1			3		36	121	56	9	8		15	176	7	25	30	42		
1	1	1						2	5	3		3		4	8						
32	20	9				2		18	87	52	3	6		75	122	9		4	17	1	
	1	1						4	20	10				12	35			1	3		
									8	1	1				8				1		
								1							1						
								1	4	2	1			3	2				1		
2	3	3							9	3				4	19		1				
2	1					1		4	11	10	1			6	28	7					
									3	14		2		4	11	1			3		
4	2	1						7	37	21				2	70	2	1	1			
									2						1				1		
									1	3					4						
2						1		2	19	3	2			5	18	1	1	1	14		
1								2	1	7					14	1		1	1		
	1							6	14	11		3		2	8	4	1	11	7		
	1								3	2						3	1		2		
3	7		1			2		4	22	5					12	5	12	14	11	1	
4	4	5		1		1	1	7	20	14	1	2		8	22	9	4	13	32		
									1						3						
								2	5					2	5						
	1							1	1					1	2						
								1	2	1				4							
1	1					1		1	7	1		1		2	4	3			3		
1								1	5	3	1			3	8		2		1		
234	221	101	7	1		32	2	412	1,643	944	278	256	30	800	2,177	142	122	221	593	4	1

TABLE 11

Total Immigration to Canada, Showing Racial Origin by Country of Last Permanent Residence, for the Fiscal Year Ended March 31, 1945

Country of Last Permanent Residence	Totals	Bohemian	Slovakian	Hebrew	English	Irish	Scotch	Welsh	North American Indian	Mexican	Spanish American	Croatian	Serbian	Belgian	Bulgarian	Czech	Finnish	French	German	Greek	Dutch	Magyar	Italian	Jugo-Slavian	Polish	Roumanian	Russian	Danish	Icelandic	Norwegian	Swedish	Swiss	Ruthenian	Esthonian	Lettish	Lithuanian	Maltese	Portuguese	Spanish	Negro	Armenian	Syrian
Africa (British)	17				9	1	1														2				3						1										
Africa (Not British)	8				2		5																								1										
Antigua	5																																				5				
Argentine	1																			1																						
Australia	13				7	2	2																		1	1															
Austria	2			2																																					
Bahamas	12				9		1							1																1											
Barbados	21				11		2																																3		
Belgium	7			2										2									3																2		
Bermuda	28				19		2											5																						
Bolivia	2				1		1																																		
Brazil	18				10		1												1											1	1		4								
Chile	8				6	1																	1																		
China	13				9	1	2											1																							
Colombia	8				4		1				1			1								1																			
Cuba	8				1													1			2																4			
Czecho-Slovakia	9															8		1																						
Denmark	1																											1												
Ecuador	6				4											1			1																					
England	5,937	1		60	4,965	219	303	64					1	5		7	2	143	37	2	19	18	17		26	1	8	10	1	5	3	5	6			2			4			3
Egypt	4				1													1																		1					1
Eire	41				2	33	3											3																							
Esthonia	2																																2							
Falkland Islands	2				2																																			
France	10													1				9																						
Germany	5			3															2																					
Guiana, British	16				10	2	1											1																			1		1		
Haiti	1				1																																			
Hawaiian Islands	1																	1																						
Holland	1																				1																			
Honduras, British	2								1		1																														
Hong Kong	4			4																																				
Hungary	2			2																																				
India	18				11	3	3	1																																	
Ireland (Northern)	16				4	12																																		
Italy	1																						1																	
Jamaica	71				47	3	9				2			1				1	1		1																		5		1
Jugo-Slavia	1																							1																
Labrador	1				1																																			

Latvia	1																																		1							
Lesser British Isles	15				14		1																																			
Lithuania	1			1																																						
Malta	1				1																																					
Mexico	7				1		3			1	1														1																	
Montserrat	2																																							2		
Newfoundland	3,423			2	2,845	340	100	5	1					2				104	8		2		2		2		1	1		4	1	1	1									1
New Zealand	27				21	1	5																																			
Nicaragua	6				5		1																																			
Norway	1																													1												
Palestine	4			3		1																																				
Panama	2																	2																								
Peru	3				2						1																															
Philippine Islands	1				1																																					
Poland	16			6																					9								1									
Puerto Rico	3				1		2																																			
Portugal	7			4															3																							
St. Pierre and Miquelon	3																	3																								
St. Vincent	4				4																																					
Scotland	673				83	28	531	4										20	2		1		1										1			1					1	
South America (N.E.S.)	2				2																																					
Spain	5			4																																			1			
Sweden	1																														1											
Switzerland	4																	1					1		1							1										
Syria	2																	2																								
Trinidad	44				31	1	4	1										4																					2	1		
Ukraine	1																																1									
United States	4,625	3	7	237	1,574	541	549	48	21		4	1	3	8	2	9	10	653	312	15	131	24	51	10	76	4	42	36	6	55	91	13	17		1	7		2	3	42	2	15
Uruguay	2															2																										
Venezuela	3				1	1																																	1			
Wales	84				26	2	5	49										1												1												
West Indies, British (N.E.S.)	9				4																																			4		1
Not given	1																	1																								
Totals	15,306	4	7	330	9,752	1,192	1,538	172	23	1	10	1	4	21	2	27	12	958	367	18	159	43	77	11	119	6	51	48	7	68	97	22	31	2	2	10	1	8	15	65	3	22

TABLE 12

Immigration, Showing Nationality and Sex, for the Fiscal Year ended March 31, 1945

Nationality	Via Ocean Ports					From the United States					Grand Totals
	Totals	18 Years and Over		Under 18 Years		Totals	18 Years and Over		Under 18 Years		
		M.	F.	M.	F.		M.	F.	M.	F.	
Argentinian	1	1									1
Belgian	3	1	2								3
Brazilian	1		1								1
British	10,564	1,369	5,545	1,806	1,844	907	173	538	94	102	11,471
Central American	3	1	1		1						3
Cuban	5	3	2			1		1			6
Czecho-Slovakian	12	7	4		1	3	2	1			15
Danish	1		1								1
Dutch	1	1				1	1				2
Esthonian	2	2									2
Finnish						1		1			1
French	11	3	5	1	2	10	1	8	1		21
German	11	6	5			2	1	1			13
Greek						1	1				1
Hungarian						1		1			1
Italian	3	1			2	1	1				4
Jugo-Slavian	9	4	3	1	1	1		1			10
Latvian	1	1									1
Liechtenstein	3		1		2						3
Lithuanian	1	1									1
Peruvian	1	1									1
Polish	25	12	10	2	1	1		1			26
Roumanian	3	1	2								3
Russian	1		1			2	1	1			3
Spanish	1	1				1	1				2
Swedish	1	1				2	1	1			3
Swiss	3	2	1			2	1	1			5
U.S. Citizens	14	3	5	5	1	3,687	1,021	1,580	554	532	3,701
Uruguayan	1	1									1
Totals	10,682	1,423	5,589	1,815	1,855	4,624	1,205	2,136	649	634	15,306

TABLE 13

Rejections, at Ocean Ports, by Causes and Nationalities, from 1902-3 to 1944-5

—	Fiscal Years																								Totals
	1902-3 to 1912-3	1913-4 to 1922-3	1923-1924	1924-1925	1925-1926	1926-1927	1927-1928	1928-1929	1929-1930	1930-1931	1931-1932	1932-1933	1933-1934	1934-1935	1935-1936	1936-1937	1937-1938	1938-1939	1939-1940	1940-1941	1941-1942	1942-1943	1943-1944	1944-1945	
By Causes																									
Medical causes	4,162	1,029	130	83	40	95	104	94	78	39	26	16	17	9	13	11	8	7	10	11	20	16	16	16	6,050
Civil causes	5,094	5,604	862	948	226	594	215	266	243	444	298	213	177	206	183	236	202	170	167	225	129	122	169	130	17,123
Totals	9,256	6,633	992	1,031	266	689	319	360	321	483	324	229	194	215	196	247	210	177	177	236	149	138	185	146	23,173
By Nationalities																									
British	1,240	978	187	199	109	209	150	154	160	251	180	126	123	150	123	138	86	94	124	95	90	89	141	110	5,306
American	175	134	6	11	.....	5	2	3	8	6	4	13	11	13	7	7	4	9	5	4	1	1	1	5	435
Other countries	7,841	5,521	799	821	157	475	167	203	153	226	140	90	60	52	66	102	120	74	48	137	58	48	43	31	17,432
Totals	9,256	6,633	992	1,031	266	689	319	360	321	483	324	229	194	215	196	247	210	177	177	236	149	138	185	146	23,173

TABLE 14

Deportations, After Having Been Admitted, by Causes, Nationalities, and Provinces, from 1902-3 to 1944-5

	Fiscal Years																								
	1902-3 to 1912-3	1913-4 to 1922-3	1923-1924	1924-1925	1925-1926	1926-1927	1927-1928	1928-1929	1929-1930	1930-1931	1931-1932	1932-1933	1933-1934	1934-1935	1935-1936	1936-1937	1937-1938	1938-1939	1939-1940	1940-1941	1941-1942	1942-1943	1943-1944	1944-1945	Totals
By Causes																									
Medical causes	2,296	2,213	649	420	410	470	519	650	600	789	697	476	301	144	81	47	42	36	29	12	14	20	15	21	10,951
Public charges	2,853	4,517	775	543	506	354	430	444	2,106	2,245	4,507	4,916	2,991	464	125	110	46	45	18	8	1	.....	2	3	28,009
Criminality	1,083	3,989	511	520	453	447	426	441	591	868	1,006	836	493	267	207	117	101	114	110	83	69	100	111	99	13,042
Other civil causes	530	793	93	58	189	149	257	194	107	200	270	277	250	172	163	240	203	229	237	322	371	121	101	58	5,584
Accompanying deported persons	145	262	78	145	158	165	254	235	559	274	545	626	439	81	34	57	21	10	5	3	3	3	1	.....	4,103
Totals	6,907	11,774	2,106	1,686	1,716	1,585	1,886	1,964	3,963	4,376	7,025	7,131	4,474	1,128	610	571	413	434	399	428	458	244	230	181	61,689
By Nationalities																									
British	4,358	5,226	1,377	985	899	808	1,047	1,083	2,983	3,099	4,248	4,251	2,718	385	157	202	134	135	127	108	135	82	74	62	34,683
American	1,066	4,566	417	321	330	351	297	294	228	279	260	331	319	199	146	167	138	145	147	124	107	104	96	82	10,514
Other countries	1,483	1,982	312	380	487	426	542	587	752	998	2,517	2,549	1,437	544	307	202	141	154	125	196	216	58	60	37	16,492
Totals	6,907	11,774	2,106	1,686	1,716	1,585	1,886	1,964	3,963	4,376	7,025	7,131	4,474	1,128	610	571	413	434	399	428	458	244	230	181	61,689
By Provinces																									
Maritime Provinces	147	409	38	32	43	48	48	70	93	148	252	244	260	62	42	61	27	40	61	136	150	96	85	67	2,659
Quebec	1,589	2,197	301	206	233	233	240	255	480	509	984	1,343	596	163	106	129	102	112	103	139	178	48	48	35	10,329
Ontario	2,896	4,243	547	675	620	581	646	600	1,115	1,788	2,828	2,626	1,827	347	167	127	123	121	96	80	82	59	43	41	22,278
Manitoba	.....	1,310	802	242	195	177	279	403	1,296	625	1,014	858	408	71	43	32	21	22	8	14	4	5	6	3	18,857
Saskatchewan	1,783	691	110	115	113	118	197	173	277	414	767	490	261	91	36	26	14	28	9	.....	1	9	9	3	
Alberta	.....	1,041	102	134	178	169	260	187	396	511	631	738	467	184	79	77	40	19	32	9	9	7	6	8	
British Columbia	491	1,876	206	282	334	259	216	276	306	381	549	832	655	210	137	119	86	92	90	50	34	20	33	24	7,558
Yukon Territory	1	7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	8
Totals	6,907	11,774	2,106	1,686	1,716	1,585	1,886	1,964	3,963	4,376	7,025	7,131	4,474	1,128	610	571	413	434	399	428	458	244	230	181	61,689