

DOMINION OF CANADA

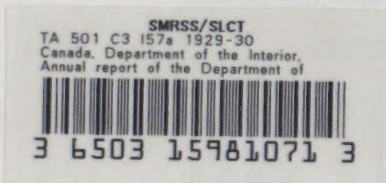
ANNUAL REPORT

OF THE

DEPARTMENT OF THE INTERIOR

FOR THE

FISCAL YEAR ENDED MARCH 31, 1930



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REPORT OF THE
DEPARTMENT OF THE INTERIOR
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REPORT OF THE DEPUTY MINISTER

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

MAY IT PLEASE YOUR EXCELLENCY:

The undersigned has the honour to lay before Your Excellency the report of the transactions of the Department of the Interior for the fiscal year ended March 31, 1930.

Respectfully submitted,

THOMAS G. MURPHY,
Minister of the Interior.

OTTAWA, November 17, 1930

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DEPARTMENT OF THE INTERIOR

REPORT OF THE DEPARTMENT OF THE INTERIOR

1929-30

Honourable Thomas G. Murphy,
Minister of the Interior,
Ottawa.

SIR,—I have the honour to submit the fifty-seventh annual report of the Department of the Interior for the fiscal year ended March 31, 1930.

During the period under review considerable advance was made toward the completing of arrangements for the transfer to the western provinces of the natural resources within their boundaries, but the administration remained wholly with the Department throughout the fiscal year. Broadly speaking, except for the last few months, settlement and development of all kinds went forward at a more rapid pace than in the preceding year. However, this increased activity, gratifying as it was in itself, did not alter the relative proportions of the different divisions of the work of the Department; for it must be borne in mind that services rendered by the Department of the Interior have not, for a good many years, been confined to the duties directly connected with the management of the federal domain in the western provinces. Even when the transfer is completed the Department will directly control in the Northwest Territories, Yukon Territory and National Parks an area of 1,528,000 square miles, almost two-fifths of the whole Dominion, and will also be responsible for the carrying on of the general work of conserving all natural resources placed upon it in 1921, when, at the direction of Parliament, it took over the work of the Commission of Conservation.

In the work of the Dominion Lands Administration during the fiscal year there was an increase of 1,347 in the total number of homestead entries granted, as compared with 1928-29. While the total for this year does not compare with the figures for the years of the decade preceding the war this upward trend is a satisfactory indication of renewed interest in land settlement. There was a general auction sale of school lands in Saskatchewan and smaller sales in Manitoba and Alberta and satisfactory prices were realized. Farmers and ranchers are making increased use of Dominion lands for the grazing of stock. Returns show an increase over 1928-29 of over eighty-six thousand head of live stock grazing on Dominion Government leaseholds.

There was an expansion in all branches of the mining industry in Western Canada. The rapid extension of the Turner Valley oil and gas field was one of the outstanding features and a production of well over a million barrels of petroleum was attained in the year. The bringing in of the large number of producing wells in the Turner Valley created a problem in regard to the disposal of surplus gas. The burning of such gas has taken place since 1924, but until lately it was done only for short periods in summer when the demand for gas in the cities and towns was low. So soon as the waste became continuous, joint action was decided upon by the Dominion and Alberta Governments, and a committee was appointed to investigate the situation. In its report the committee stated that the only solution that would make conservation possible was a recognition of the fact that

Turner Valley was a gas field and the formulation of rigid regulations for the purpose of controlling all phases of the gas-producing industry. The problem is still receiving consideration. In the matter of mining for metallic ores efforts were made to investigate those deposits previously located in northern Manitoba and Saskatchewan. The trend of the search for minerals appears to have been northwards, several large companies having undertaken a vigorous prospecting program in the Northwest Territories, which are being closely studied by organized expeditions based on aerial transport. However, notwithstanding the advances in the production of oils and metals, coal mining still remains the major mining industry on Dominion lands, and the amount of coal mined compared favourably with that for 1928-29. The coming into force of the new Quartz Mining Regulations added to the duties of the Supervisory Mining Engineer and his staff, entailing as it did the covering by the mining inspectors of large areas in northern and eastern Manitoba, and northern Saskatchewan, and from Hudson bay to Great Slave lake in the Northwest Territories.

The Forest Service had a season of great activity. Unusual climatic conditions during the winter of 1928-29 and the spring and summer of the following year were responsible for the fact that the forest fire situation from western Ontario through to the Pacific coast was one of the severest experienced since forest-fire protection was organized. While losses were greater than the average of the preceding five years, they were undoubtedly kept below what otherwise they would have been by the efficient organization maintained for fire prevention and fire suppression. There was a slight decrease in timber sales but there was much activity in other methods of timber disposal, and all the minor lines show an increase.

During the year a co-operative arrangement was effected by the Dominion Government and the provinces looking to a national inventory of forest resources. The Forest Service, besides working in the Prairie Provinces, has undertaken the work of compiling the returns for the whole Dominion.

Substantial progress has been made in research both on its silvicultural and industrial sides, in the latter especially in regard to pulp and paper. Important other research fields are those of the fundamental problems of forest protection from fire, the rates of growth of Canadian tree species and the better utilization of raw materials. The work of distributing trees to prairie farmers for the planting of shelterbelts continues to expand. Over 8,750,000 trees were sent out in the year to nearly 7,500 farmers and the plantations both of this and of previous years made good growth. The establishment of gardens and orchards in the shelter of these windbreaks is an important feature of prairie life. The collection of tree seed was carried on in the different provinces and over five tons was extracted and distributed, most of it to Great Britain, Australia, and New Zealand.

Steady progress was maintained during the year in the expansion and development of Canada's National Parks system. The outstanding event of the year was the acquiring of two new areas, one in Manitoba, and the other in Ontario. The Riding Mountain national park in the province of Manitoba covers an area of approximately 1,100 square miles. The other reservation, Georgian Bay Islands park, consists of a series of small islands in the Georgian Bay district of Ontario, the largest of which, Beausoleil island, is not only eminently suited as a summer resort, but is rich in legendary and historic interest.

There was a most satisfactory increase in the amount of motor travel to the different parks, over 70,000 more tourists having visited them than in the preceding year. A main factor in the steady increase of tourist travel is the fine system of trails and highways maintained in the parks. The most important highway development during the past year was the commencement of construction of the Big Bend highway between Donald and Revelstoke, B.C.

A revision of the boundaries of the parks on the eastern slope of the Rockies has been in progress. During 1927 an investigation of the eastern areas of Banff and Jasper national parks was conducted to determine the most suitable method of re-locating the boundaries from a standpoint of travel, and the preservation of wild life.

Through the establishment of an adequate system of game patrols and enforcement of the regulations, the increase in wild life has been most gratifying. Native species have re-established their numbers to such an extent that the parks are becoming more and more the wild-life reservoirs of the country.

The protection of migratory birds is a matter which receives the careful consideration of the Department, and in June last amendments were made to the regulations based on the *Migratory Birds Convention Act* following receipt of suggestions from the provincial game officers, and the chief federal migratory bird officers.

The Historic Sites and Monuments Board marked many new sites of national interest during the past year, and a great deal of restorative work was carried out in connection with the larger sites already controlled.

The past year was one of great activity in the various phases of the work of the Dominion Water Power and Reclamation Service. Water-power, which has given such impetus to our industrial life, has developed to an extent that a few years ago would have been considered phenomenal. The new construction during the year 1929 brought the total installed horse-power to 5,727,600, and the completion of work now under way will further increase this imposing figure. Developments cover practically all the provinces and all lines of industry, with a marked widening of the use of power in the domestic, municipal, mining, and agricultural fields. In the year under review, the three Prairie Provinces made a most marked advance in water-power development. Interim licences were in effect covering the Ghost site on the Bow river in Alberta, the Island Falls site on the Churchill river in Saskatchewan, and the Seven Sisters, and the Slave Falls sites both on the Winnipeg river in Manitoba. In Canada generally hydro-electric development showed no signs of slackening. Construction actually in progress should add an installation of 1,600,000 h.p. within the next three years.

International waterway matters continued in an increasing degree to engage the attention of the Branch. The Convention and Protocol signed between Canada and the United States, providing for the construction of remedial works at Niagara falls for the preservation and enhancement of their scenic beauty, was ratified by the Dominion Parliament on May 20, 1929. The Convention awaits the ratification of the United States Senate. Matters concerning other boundary waters were also dealt with.

The Dominion Hydrometric Survey embraces stream measurement throughout Canada. The records are brought together in one central agency which attends to the compilation and dissemination of stream-flow data. The uses to which the records are put are primarily in connection with water-power development and irrigation projects.

Irrigation work was pursued energetically, a reclassification of lands in the major projects was continued, together with studies of more efficient irrigation methods as applied to sugar beet growing, and other agricultural problems.

Great interest and activity was manifested in Northern Canada during the past fiscal year. The tremendous advances in transportation and communication made possible by the aeroplane and the wireless have pushed forward exploration and development into regions hitherto practically inaccessible. The possibilities of our far northern possessions as a great mining area have already attracted widespread attention, and many mining companies financially well supported are carrying out an extensive program of prospecting, and aerial

exploration for minerals. The North West Territories and Yukon Branch is charged with the responsibility of carrying out the governmental policy of broader development activities, and the present year has been an unusually active one in administration, exploration, and the dissemination of knowledge concerning the territory under its jurisdiction.

The annual expedition to the posts in the Canadian Arctic sector was carried out successfully on board the ss. *Beothic*. All posts were reprovisioned and changes effected in the personnel.

During the year a field inspection of the Mackenzie District of the North West Territories and of Yukon Territory was made by the Director of the Branch. In accordance with the policy of the Department to maintain careful supervision of the health and welfare of the natives of the region, medical services have been brought to a high state of efficiency, and several new medical stations were established during the year. Medical stations are now located at Aklavik, at the mouth of the Mackenzie; Coppermine, on the Arctic coast; Chesterfield, on the west side of Hudson bay; and Pangnirtung, on Baffin island. By co-operation with the Department of Indian Affairs, medical officers are also maintained at Fort Smith, Resolution, and Simpson, while assistance is given to the Anglican and Roman Catholic mission hospitals at other important centres.

A feature of the exploratory work completed during the year was the discovery of the breeding grounds of the blue goose on Baffin island, and the examination and patrol of the Thelon Game Sanctuary east of Great Slave lake. The selection of the 3,000 Alaskan reindeer intended as the nucleus of herds to be established for the benefit of the natives in Arctic Canada was made during December, 1929, and the overland movement to the Mackenzie delta begun.

During the year, seven meetings of the Northwest Territories Council were held, and many important matters pertaining to development and to the maintenance of the native population were dealt with.

The revenue from the administration of the *Northwest Game Act* increased to the extent of \$15,619.31 over the amount received during the previous year.

All branches of survey work—geodetic, topographic, aerial, and boundary—carried on by this Department are co-ordinated under the Surveys Bureau, in charge of the Director General of Surveys.

Every phase of the work of the Geodetic Survey was advanced during the year. The geographical positions of an increased number of geodetic stations were determined with the highest attainable accuracy. These are required as basic control for Canadian mapping operations. Triangulation nets and precise traverses were extended and base lines for length control in triangulation were measured with first-order accuracy. Bench-marks were established over an increased mileage along railways and highways throughout Canada. Field parties of the Levelling Division operated in five provinces.

Steady progress is being made by the Topographical Survey in the mapping of the Dominion. The field work of this branch includes ground surveys, aerial surveys, legal surveys, land classification work, and interprovincial boundary surveys. The work of issuing maps of the newer parts of Canada, where development is particularly active, is being greatly assisted by the use of aerial photographs. Field operations were carried on in all the provinces and in the Northwest and Yukon Territories. The area covered by newly issued maps was 106,302 square miles. The Physical Testing Laboratory carried out a number of important investigations in addition to its regular work of testing, readjustment, and certification of the various scientific instruments.

The importance of aerial photography in the production of maps and in furthering exploration and development is seen in the increasing demands for this service. During the past year 48,025 square miles were covered by oblique and 26,230 square miles by vertical photographs.

The Canadian and United States members of the International Boundary Commission held two conferences during the past fiscal year. The first took place in Washington in April, when a division of the field work to be done during the summer was made, and the second in Ottawa in November, when the joint reports required by the treaty of 1908 were considered.

The Dominion Observatory at Ottawa and the Dominion Astrophysical Observatory at Victoria, B.C., each carried out a very full program of observations. Investigations were continued in the fields of seismology, terrestrial magnetism, and stellar spectra photometry. A number of scientific publications were issued. The Astrophysical Observatory completed the program of observation of Wolf-Rayet stars, begun in 1927.

The work of the National Development Bureau, formerly designated the Natural Resources Intelligence Service, expanded along its several lines of activity. In the field of industrial surveys special investigations were carried out in regard to the utilization of raw materials and products of specified areas. During the past fiscal year, departmental co-operation was solicited by the boards of trade of nearly all the principal cities of the western provinces, and a comprehensive industrial survey was made of the Border Cities district in Ontario. Numerous inquiries were received during the year both from this country and abroad, covering a wide range of resources and industrial subjects. The domestication of fur-bearing animals has centred interest in Canada's fur resources and, based on the information gathered on this important industry, a number of reports were issued.

Tourist traffic is now recognized as one of the major factors in Canadian development. In order to maintain and increase this important industry every effort is made to furnish the prospective tourist with authentic information in regard to Canada's recreational facilities. By means of a wide distribution of informative publications, co-operation was maintained with practically all trade and travel organizations of importance in different countries.

The importance of economic geography in relation to national progress is now generally recognized. Extensive investigations in this field were carried out, as a result of which many of the series of economic maps were revised, and a number of new maps issued. Considerable progress was made in the preparation and issue of official maps of Canada.

The technical plant is increasingly made use of by this and other federal departments. The photographic library covers all fields of development in Canada and is constantly kept up to date. Photographs for reproduction purposes are in great demand by syndicate newspaper services, chambers of commerce, trade commissioners, and other organizations at home and abroad.

Outlines of the work of the several branches of the department follow.

DOMINION LANDS ADMINISTRATION

Lands Patents

Letters Patent.—The number of letters patent issued during the fiscal year was 5,997, covering an area of 832,665 acres, made up by provinces as follows:—

Province	Patents	Acres
Manitoba.....	604	81,898
Saskatchewan.....	2,621	376,784
Alberta.....	2,338	349,240
British Columbia.....	425	24,558
Yukon Territory.....	2	180
Northwest Territories.....	7	5
Totals.....	5,997	832,665

Homestead Entries.—Seventeen thousand five hundred and four (17,504) homestead entries (including 4,952 second homesteads) were granted during the year, aggregating an approximate area of 2,800,640 acres, being an increase of 1,347 in the number of homesteads granted as compared with the previous year.

By provinces the entries were made up as follows: Manitoba, 727; Saskatchewan, 6,089; Alberta, 9,795; British Columbia, 893; total, 17,504.

There were 720 soldier grant entries made during the year, aggregating an approximate area of 115,200 acres, made up by provinces as follows:—

	Number of entries	Acres
Manitoba.....	19	3,040
Saskatchewan.....	224	35,840
Alberta.....	422	67,520
British Columbia (Railway Belt and Peace River Block) ..	55	8,800
Totals.....	720	115,200

There were 4,952 second homestead entries made during the year, aggregating approximately 792,320 acres, made up by provinces as follows:—

	Number of entries	Acres
Manitoba.....	182	29,120
Saskatchewan.....	2,061	329,760
Alberta.....	2,470	395,200
British Columbia (Railway Belt and Peace River Block) ..	239	38,240
Totals.....	4,952	792,320

Refunds.—Value of improvements collected on cancelled homesteads—762 refunds—\$41,447.81.

Newly Surveyed Lands Thrown Open to Homestead Entry.—Newly surveyed lands included in 37 townships were made available for homestead entry as follows:—

Province	Number of townships
Manitoba.....	4
Saskatchewan.....	3
Alberta.....	28
British Columbia.....	2

School Lands

During the fiscal year ended March 31, 1930, school lands were disposed of by public auction and private sales in the provinces of Manitoba, Saskatchewan, and Alberta as follows:—

Province	Area in acres	Value	Average per acre
Manitoba.....	4,230.97	\$ 50,403 19	\$ 11 91
Saskatchewan.....	372,010.73	5,435,353 70	14 61
Alberta.....	28,676.93	345,992 43	12 06

The approximate net areas disposed of to March 31, 1930, after making deductions for cancelled sales and adjustments in regard to changes in area, were as follows:—

Province	Area in acres	Value	Average per acre
Manitoba.....	635,480.74	\$ 6,101,913 80	\$ 9 60
Saskatchewan.....	2,119,796.68	33,198,820 73	15 66
Alberta.....	1,234,647.53	17,554,966 53	14 22

The revenues collected for the fiscal year (less principal moneys and less expenditures) and paid over to the provinces were as follows: Manitoba, \$87.18; Saskatchewan, \$303,535.75; Alberta, \$411,983.77.

The amounts of interest paid in the fiscal year on the investments to the three provinces were as follows: Manitoba, \$294,525; Saskatchewan, \$835,225; Alberta, \$459,175.

Mining Lands

The report of the Mining Lands Division for the fiscal year 1929-30 shows that the total revenue for the year (\$1,638,597.74), was over half a million dollars greater than in 1928-29. The collection of royalty from the petroleum industry began on January 1, 1930, and over \$30,000 was collected on this account during the last three months of the fiscal year.

In the Northwest Territories continued interest was maintained in prospecting for minerals under the provisions of the Quartz Mining Regulations. Development work was done on certain properties situated south of Great Slave lake. New discoveries were made in the vicinity of Great Bear lake and other points. An Order in Council was passed making available for location on July 1, 1930, an area of land in the vicinity of the Coppermine river which had been under reservation for a number of years.

In Yukon Territory the concentrating mill of the Treadwell Yukon Company Limited, operated during the whole year. This is situated at Keno, Mayo district. The value of the minerals produced from this district was over \$2,000,000. Placer mining with dredges and by the hydraulic method of mining continued in Yukon Territory, but the output from quartz mines in the Mayo district now exceeds the value of the production from the placer mines.

The mill of the Central Manitoba Mines Limited, in the province of Manitoba, operated continuously, and that province before the end of another year will witness the completion of the extensive mill and smelter constructed by the Hudson Bay Mining and Smelting Company Limited, to treat the ores from the Flin Flon mine, and this plant will also treat the ores from the Sherritt-Gordon mine.

Owing to new discoveries of oil and to the interest taken by companies from other parts of the world, an increasing interest was manifested in the oil fields of Alberta, but the production of coal from mines in Alberta remained the principal mining industry on Dominion lands.

Timber and Grazing

Due to the unusual circumstances which prevailed during the past fiscal year, and which were particularly felt in the western provinces, there was a decrease of \$256,990.94 in the revenue from timber, grazing, and hay lands as compared with 1928-29. Compared with the previous year, there was a marked advance in the quantities of lumber manufactured, the increase over that of last year being over 60,000,000 feet board measure, but owing to the business depression in the latter part of the year, a large portion of manufactured material remained unmarketed. As a consequence of these conditions, the revenue from licence and permit berths was considerably reduced.

The grazing regulations established in the year 1925 allowing for the granting of twenty-one-year leases have given a decided impetus to stock raising. Stock returns from approximately 95 per cent of the present leaseholders show the number of stock grazing on leaseholds on Dominion lands to be considerably in excess of any previous year.

A continued increase in the number of hay permits issued, together with the number of tons cut, was recorded during the past fiscal year, accounting for an increase in revenue from this source amounting to \$3,799.58 over the previous year.

Ordinance, Admiralty, and Public Lands

The fiscal year 1929-30 was one of activity from the standpoint of administration, the main efforts being directed towards the securing of information relative to titles and to complete the records it was necessary to conduct investigations in several of the registry offices.

The revenue for the year shows a substantial increase, and from the sale of fractional areas and accrued lands there was derived the sum of \$98,012.90 in comparison with \$52,472.74 for the previous year. The revenue from Ordinance lands amounted to \$30,308.90 an increase of \$5,478.81 over the fiscal year 1928-29.

In the past, grants of land had been made by Parliament to railway companies to aid in the construction of colonization railways, and claims were subsequently made by the companies that they were entitled to the mineral rights, in addition to the surface rights, and the question became the subject of decision by the Imperial Privy Council. As it was ruled that title to the minerals should pass to the aforementioned companies, many difficulties had to be overcome before patents could issue. The completion of this work required considerable research, as the grants amounted to 31,784,610 acres.

New applications to purchase land numbered nearly five hundred, and sales were consummated in 320 cases, covering a total of 12,882 acres.

SUPERVISORY MINING ENGINEER

The fiscal year has been one of great activity in the various fields of mining enterprise which have grown up of late on lands under the administration of the department, namely, those associated with the search for, development and production of metals, coal, petroleum and natural gas. This activity has been particularly marked in the case of metals and oil and gas, which have attracted very great interest on the part of operators, following on the favourable results chronicled in the annual report for 1928-29.

The area over which prospecting for minerals under the Quartz Mining Regulations was carried on was much extended, largely owing to the successful application of the aeroplane both for transport and for reconnaissance purposes. In this manner operations were carried far into the Northwest Territories and a number of interesting mineral occurrences of economic importance were noted. Development work proceeded on a number of properties already acquired, notably in northern Manitoba and Saskatchewan, the construction work at the Flin Flon and Sherritt-Gordon mines, and on the power plant at Island Falls, making marked progress and bearing witness to the importance of these undertakings. The one producing property was that of the Central Manitoba Mines, Limited, at Long lake in the Rice Lake division of the Winnipeg mining district.

The new Quartz Mining Regulations came into force on April 1, 1929, and were found to function smoothly and to receive general approval. To meet the requirements of the growing activity in the Winnipeg district an office, subsidiary to that already in existence at The Pas, was opened at Winnipeg.

Coal mining operations were continued on the same scale as hitherto in Alberta and Saskatchewan. Prospecting in certain areas, notably north of Luscar and on the Kipp-Retlaw extension of the Canadian Pacific Railway, met with success, discoveries in the latter area being brought to the production stage. Briquetting of Saskatchewan coals now appears to be established as the basis of a permanent industry, a ready market being found for the briquettes in Winnipeg and elsewhere.

In connection with petroleum and natural gas, Turner Valley and other areas in Alberta became the scene of great drilling activity, already foreshadowed towards the close of the previous year. Although many of the new wells started were subsequently suspended, the number reaching the limestone, in which occurs the naphtha-laden gas of Turner Valley, enabled the productive area to be much increased. Every well drilled into the limestone encounters gas, the production varying considerably in different wells. The total production of naphtha exceeded one million barrels, this being by far the most important product utilized.

The systematic testing of other areas was prosecuted with equal vigour by means of detailed geological mapping, test drilling, and deep drilling; and geo-physical methods of prospecting were introduced. Operations have been successful, production being increased in areas already established; other structures have been recognized and are in process of further testing; and an important new area proven and brought into production at Red Coulee, five miles west of Coutts.

A matter of much concern to the Department ever since the discovery of the Turner Valley naphtha-laden gas has been the waste of much of the gas after it was separated from the naphtha. This waste, so long as it was largely seasonal, did not appear to consist of a product that could be marketed, although the matter was kept under careful investigation. When, however, during the winter of 1928-29 the volume produced became such as to result in waste on a large scale, a joint committee of Dominion and Provincial Government officers was appointed to go into the matter and report.

FOREST SERVICE

The transfer to the western provinces of their natural resources will result in a very considerable change in the duties of this branch of the department by relieving it of a large part of its administrative responsibilities and permitting it to expand its investigative and advisory work. Substantial progress has already been made in silvicultural, economic, and industrial research through the work of the Silvicultural Research Division and the Forest Products Laboratories. Important fields for further investigation are the fundamental problems of forest fire protection, the rates of growth and other silvicultural characteristics of Canadian tree species, the better utilization of the raw materials furnished by Canadian forests, and the Dominion-wide forest inventory.

Owing to almost unprecedented meteorological conditions during the winter of 1928-29 and the spring and summer following, the forest fire situation from western Ontario through to the Pacific coast was one of the severest ever experienced since forest fire protection was organized. Efficient fire protection, however reduced losses to a figure that, while considerably greater than the average of the preceding five years, was much less than might have been expected from the unusual conditions.

During the year a co-operative arrangement was effected by the Dominion Government and the provinces, looking to a national inventory of forest resources. The Forest Service, besides working in the Prairie Provinces, has undertaken the work of compilation of the returns for the whole Dominion. It is hoped to have the work completed in about five years.

The revenue for the year shows a decrease, mainly attributable to a falling off in the revenue from timber sales in Saskatchewan. In other methods of timber disposal, much activity was shown and minor sources of revenue generally show increases.

The use of the forest reserves for purposes of recreation continues to increase, and additional facilities were provided for this purpose.

Forest surveys were continued in Manitoba and Saskatchewan, particular attention being given to the work of a forest inventory of the former province.

At the extracting plant at New Westminster, B.C., five and one quarter tons of seed were extracted from 8,800 bushels—about thirteen carloads—of cones; of this amount two and one quarter tons were sent to Great Britain for the use of the Forestry Commission, and further large quantities to the Irish Free State, New Zealand and Australia.

The number of active timber sales shows a considerable increase, though the revenue from this source decreased somewhat owing to restricted operations under existing market conditions.

The unfavourable weather conditions made this season an unpropitious one for work at the Indian Head and Sutherland nursery stations, and for newly set out tree plantations on the farmsteads throughout the Prairie Provinces. Established plantations came through the season well. The interest of farmers in ornamental trees, shrubs, flowers, lawns, and fruit trees is growing; shelterbelts for the protection of field crops are slowly increasing in number and their benefits are being experienced. The total number of broad-leaved trees distributed (to 6,486 applicants) was 8,673,650, and of conifers (pine and spruce) 138,700 were sent to 966 applicants.

Research work at the Indian Head nursery station received much attention. Many experimental plantations were surveyed and plotted; the effects of mixing different species were studied, as was also the effect of field-shelters on grain crops. In the sphere of forest pathology an intensive study was begun of poplar canker, and "damping-off" is also being investigated. Tests of apples, plums, and bush-fruits grown under the protection of shelterbelts are being carried on both at Indian Head and at Sutherland.

Exceptional activity has characterized the work of the Forest Products Laboratories at Ottawa, Montreal, and Vancouver. Several important investigations were carried on jointly at the Ottawa and Vancouver laboratories; in one of these investigations the department was pleased to have the co-operation of the British Forest Products Laboratory at Princes Risborough, England. The Pulp and Paper Laboratory at Montreal continued and enlarged its work in close co-operation with the pulp and paper industry.

The Silvicultural Research Division of the service continued its sample-plot work at the Forest Research Stations and took an important part in the Dominion-wide forest survey. Considerable progress was made in the work of investigating fire-weather conditions, carried on at the Petawawa Forest Experiment Station.

The chief publication of the year was a collection of *Form-class Volume Tables*, embodying the result of several years of work in forest mensuration.

Publicity activities included a newspaper advertising campaign in the interest of forest fire prevention, lecture work in boys' and girls' summer camps, and exhibits at fairs and exhibitions in Western Canada.

NATIONAL PARKS

During the year two new areas were added to the National Parks system. The first of these is the Riding Mountain national park in Manitoba. It consists of over 1,100 square miles of rolling woodland and lake country, rising into a rugged tableland and rocky forest-clad ridges. Beautiful lakes with fine bathing beaches, and a natural abundance of wild life add to its attractions, while its accessibility to through motor highways makes it very desirable from the tourist point of view. There seems no doubt that this reserve will serve the recreational requirements of a large section of the West, and conserve for future generations a typical example of some of the most interesting scenery of this part of Canada.

The second reservation was the Georgian Bay Islands park among the Thirty Thousand Islands of the Georgian Bay region of Ontario. This consists of a number of small areas, all islands, as in the case of those set aside many years ago among the Thousand Islands of the St. Lawrence river. Of recent years the islands have been so rapidly taken up that it was felt desirable some permanent provision should be made for public access to and enjoyment of this beautiful region. The largest reservation, Beausoleil island, is eminently suited to become a resort. In addition to fine bathing beaches and beautiful groves, it possesses legendary and historic interest.

From the tourist traffic point of view the parks had a most successful year with a total increase in travel of over 70,000. The growth of motor travel continues to be the outstanding factor in tourist business and there was an increase in the number of motorists visiting the parks.

The most important highway development during the year was the beginning of construction on the Big Bend road. This section will overcome the barrier of the Selkirks and supply the last link in the western half of the All Canada Highway. The route selected, instead of crossing the Selkirks, follows the valley of the Columbia river in its great arc about these mountains, and so avoids the engineering and climatic difficulties that would have been involved by a route crossing them direct. To facilitate the building of the highway the federal Government agreed to construct the eastern leg of the road, from Donald, to Boat Encampment, a distance of approximately ninety-five miles, while the provincial Government is building the western half.

Clearing and bridge construction, which was begun by the Highway Division of the National Parks Branch early in the autumn, was continued as long as weather conditions permitted, and begun again as soon as the snow disappeared. The provincial Government is also prosecuting its section with vigour and it is expected that the whole road will be ready by 1932. The completion of the highway will mean much to the future development of Western Canada. A through way will then be open to motor travel from the prairies to the coast with a consequent benefit to both. The outstanding magnificence of its scenery and the fact that it will give direct access to five national parks should make this one of the great scenic routes of the country and attract an increasing volume of foreign travel.

WATER POWER AND RECLAMATION

International Waterway Matters.—The responsibility of the Minister of the Interior to advise the Government with respect to international waterway problems is steadily increasing and the Dominion Water Power and Reclamation Service is called upon to devote more and more time to these points. Amongst new matters arising was the application of the West Kootenay Power and Light Company to the International Joint Commission for permission to construct and operate works on the Kootenay river for the purpose of storing water in and regulating the outflow from Kootenay lake.

Water-Power.—The outstanding feature of the past year was an even greater activity in water-power development in the Prairie Provinces than was noted in the last report. Interim licences were in effect covering the Ghost site on the Bow river in Alberta, the Island Falls site on the Churchill river in Saskatchewan, the Seven Sisters and the Slave Falls sites, both on the Winnipeg river in Manitoba. These sites, with an ultimate designed capacity of 345,000 horse-power, were scenes of intense construction activity during the year. The Ghost development was completed and power produced during the past winter, the Island Falls development was so far advanced by the end of the fiscal year, it was expected that power would be available within two or three months, whilst at Seven Sisters and Slave Falls construction was proceed-

ing according to schedule. In Canada generally hydro-electric development showed no signs of slackening, for although the new turbine installation completed during 1929 of 378,000 horse-power was slightly lower than for 1928, a great deal of new work was started. In fact, construction actually in progress should add an installation of 1,600,000 horse-power within the next three years, with a further 1,500,000 horse-power when these installations are brought to their ultimate designed capacities. This new construction and the further developments not yet commenced but in early prospect, ensure a steady increase in the utilization of Canadian water-power for some years to come.

Irrigation.—A dry, hot summer following a spring of subnormal run-off, characterized the season of 1929 in southern Alberta and southwestern Saskatchewan. Such conditions caused a considerable demand for water for irrigation purposes, a demand which was fully met on the larger projects where canal and reservoir systems are designed to render the districts independent of seasonal climatic conditions. Harvest conditions were ideal and little loss was occasioned by frost. Some 912,000 acre-feet of water were diverted from the St. Mary, Oldman, Bow, and Belly rivers into the canal systems of eight major irrigation projects, where crops valued at more than eight million dollars were grown on 490,000 acres under cultivation. Of this area 260,000 acres were irrigated during the season.

Drainage.—During the past year the weather was exceptionally favourable for construction work in connection with drainage development as precipitation was somewhat below average. The Dominion Water Power and Reclamation Service made field investigations and inspections of seventy-four private drainage schemes under the provisions of the Dominion Drainage Regulations, and twenty-four new applications for small schemes were dealt with. Since 1919 one hundred and eighteen such schemes have been carried out and a very considerable area has been reclaimed and utilized for agricultural purposes. Several field investigations were made of proposed provincial drainage districts in Alberta and Saskatchewan. The Roseau River flood prevention and reclamation project was fully investigated by intensive surveys, and complete topographic maps prepared. The western scheme of the Manitoba Dairy Farms Limited was inspected. Satisfactory progress was made in constructing drainage works for the Low Water Lake project. The fur-farming leases issued totalled ninety-four and comprised 33,346 acres.

NORTH WEST TERRITORIES AND YUKON

The past fiscal year was marked by the exceptional interest manifested in northern Canada. The development of aviation as a means of transportation has made possible the reaching of regions hitherto deemed practically inaccessible. The activity in Arctic exploration, the proposals to establish international air routes between Europe and America by way of Greenland and other Arctic islands, and the quest for northern furs and minerals have been responsible for the desire for a more intimate knowledge of our northern possessions. In carrying out the department's policy of broader development activities the work of this branch has been considerably increased in scope, both in regard to administration, and the dissemination of knowledge to the general public.

The Northwest Territories Council held seven meetings during the year at which many important subjects were dealt with, including the redrafting of game regulations, grants for the protection of native orphan children, and to assist the operation of schools, hospitals, and the establishment and maintenance of medical services, together with other matters affecting Canada's Northland.

The annual expedition to the Arctic Archipelago on the ss. *Beothic* was carried out successfully despite the fact that climatic conditions were dis-

tinctly unfavourable. All the northern posts were reprovisioned and the required changes in the personnel were satisfactorily effected. At all of the places visited during the patrol conditions among the natives were found to be good, and the general health of the respective communities excellent.

During the year the Director conducted a special investigation of the posts and settlements in the Mackenzie District and Yukon Territory with a view to securing first-hand information of the rapidly changing conditions in order to advise on needed adjustments in administrative procedure.

Explorations were carried out in regard to the fauna of southwestern Baffin island, and an investigation was conducted in connection with the musk-oxen in the Thelon Game Sanctuary. With respect to reindeer a thorough investigation proved that large areas in Mackenzie District were suitable for the grazing of these animals. As a result of this and other information it was decided to purchase 3,000 head of reindeer in Alaska. The movement of these animals was begun late in 1929, and they are now being driven across country to the Mackenzie delta. Necessary arrangements are being made for the reception of the herd.

The engineering staff of the branch compiled the field notes of the various explorers and investigators. A number of surveys were made in different parts of the Territories including one of the Arctic Red River settlement.

Field medical services have been brought to a high state of efficiency, and several new medical stations were established at strategic points. In addition the Department co-operates with other Dominion Government services in maintaining medical officers at the chief settlements along the Mackenzie river.

To meet the ever increasing demand for information respecting Yukon and Northwest Territories the branch issued a number of timely publications containing authentic data with regard to inhabitants, resources, climate, transportation, and related matters.

Wild life is steadily increasing, and the larger bounty on wolves and coyotes has been instrumental in reducing to a considerable extent these predatory animals, with a resultant benefit to other forms of wild life.

The revenue derived from the administration of the *Northwest Game Act* was \$66,760.35 as compared with \$51,141.04 collected during the fiscal year 1928-29, representing an increase of \$15,619.31.

Yukon.—As a result of the deliberations of the Yukon Council several important amendments were made to existing ordinances, and new ordinances were passed regulating the hours of labour in placer mining operations, while the usual administrative details were dealt with.

Public welfare was maintained at the usual high level, the schools and hospitals being conducted in a most efficient manner, and the general health of the residents was good throughout.

The season was very good from an agricultural standpoint, an abundance of moisture resulting in large yields of high grade produce.

The Territory sustained its reputation as a Mecca for both hunters and tourists. Big game was reported as very plentiful, and many fine specimens were taken.

OBSERVATORIES

Dominion Observatory, Ottawa

Observations with the meridian circle were obtained on 196 days. In the regular program there were obtained 2,646 measurements of right ascension and declination of program, clock, and azimuth stars; 52 of planets; and 135 of the sun; also 1,039 sets of measurements of nadir and other instrumental constants. In addition to the regular program, observations were made during January with

a three-inch Cooke transit for the purpose of investigating possible errors of a systematic nature. The time service, comprising 4 primary clocks, 15 secondary clocks, 600 minute-dials, 18 second-dials, 2 tower clocks, and various relays, chronographs, and seismograph shutters, was maintained as usual; in addition 253 clocks, watches, and other time mechanisms were overhauled for other branches and departments of the government service. Wireless time signals were received regularly from England, the United States, Germany, and France. Three sets of time signals were sent out daily, one through the local broadcasting station, CNRO, and two directly from the observatory on short wavelengths. The synchronome clock was received in January and installed in the clock vault, where its rate has proved to be almost constant and free from the sudden small changes usual to sensitive master clocks.

With the eighty-foot coelostat reflecting telescope and the twenty-three-foot spectrograph, 235 observations (each containing 9 strips of spectrum) of solar limbs, midway and centre, together with iodine comparison lines, were obtained. Direct photographs were made of the nine-inch solar image on 110 occasions, recording sunspots and position lines; prints of these were supplied to the Radio Branch, Department of Marine, in connection with the study of sunspot effects on radio reception. About 430 spectrograms were measured and as many computations made of solar radial velocity and heliographic positions. Charts and information relating to long-period variations in terrestrial and astronomical phenomena were prepared in connection with an investigation of fluctuations in wild life.

The fifteen-inch equatorial was employed in the continued study of Cepheid variables and several selected spectroscopic binaries. With the spectrograph attachment 144 spectrograms were obtained, mostly of ϵ Aurigae, 1 Geminorum, η Aquilae, β Lyrae, ζ Ursae Majoris and η Virginis. η Virginis proved to be an interesting triple system with evidence of marked perturbations. The spectrograms were measured and reduced, and in collaboration with McGill University a thorough investigation of the variables α Ursae Minoris and R T Aurigae was carried out with a Moll microphotometer. The photo-electric photometer attachment was overhauled and a number of mechanical changes effected in order to increase its sensitivity. As usual the equatorial telescope was made available on Saturday nights for observations by the public.

In photographic photometry, observations on the revised list of Cepheid fields were continued for the purpose of obtaining charts of fields of the variables. Copies of charts for thirty-two fields were completed for distribution to the various co-operating observatories. Observations were also made for the determination of the light curves, and 185 plates obtained. Measurements of the magnitudes of some of the variables on the original program were continued. Tables were computed for the prediction of occultations by a semi-graphical method.

The seismographs at Ottawa, Saskatoon, Halifax, Shawinigan Falls, and Seven Falls were in practically continuous operation, and during the year 434 earthquakes were recorded, of which thirty-one were reported to the press and, by telegraph, to Science Service, Washington. Tremors of marked intensity originated in the Aleutians, in New Zealand, New York State, Alaska and at the Grand Banks off Newfoundland. The last mentioned caused serious damage and is being made the subject of a special investigation through the collection of original seismic records from the many stations scattered over the globe, and local information by questionnaire and correspondence. The seismologist was attached to a prospecting party in Turner valley, Alberta, in January for the purpose of noting the routine and results of underground investigation by modern seismic methods. Arrangements were made with the Royal Canadian Mounted Police and the Department of Marine and Fisheries for reporting earthquakes occurring in the Arctic, in connection with a continent-wide scheme of investigation.

In terrestrial magnetism determinations of the three magnetic elements, declination, inclination, and horizontal intensity, were made at six stations which were established by the Carnegie Institution in 1913 (three of which were exact reoccupations and three approximate) and at four new stations, along the water route between Sioux Lookout and Fort Albany on James bay by way of lac Seul and the Root and Albany rivers, in the area between longitudes 80° W. and 95° W. and latitudes 50° N. and 53° N. Similar determinations were also made in the vicinity of two known fault lines near Ottawa, in conjunction with torsion balance surveys for the investigation of the applicability of geophysical methods in prospecting.

In connection with the gravity observations reported last year for Greenwich, Potsdam, Washington, and Ottawa, to redetermine the adopted international standard values, a series of observations was made to determine the temperature co-efficients of the three pendulums used, and the final results were computed, completing a fairly rigorous connection between gravity values in Europe and North America. The value obtained for Greenwich agrees well with earlier determinations, while the new values for Ottawa, and Washington are slightly higher than those previously accepted. Considerable progress was made with the computations of unpublished observations of some fifteen field gravity stations in 1927. Following the recent investigations of modern European methods of geophysical prospecting, undertaken in collaboration with the Department of Mines, a torsion balance purchased by the Geological Survey was tested at the observatory and used for making traverse surveys of certain geological structures in the vicinity of Ottawa, instituting an investigation of the applicability of the torsion balance to mining in Canada.

The American Astronomical Society held its forty-second meeting at the observatory from August 26 to 29. Professor E. W. Brown of Yale University, President of the Society, presided over the proceedings. Forty-eight technical papers were read and discussed, thirteen of which were contributed by members of this observatory, five by the staff of the Victoria observatory and four from other Canadian sources. At an informal reception the visiting astronomers, some seventy-five in number, were given facilities for inspecting the work of the observatory.

Seven of the regular series of Dominion Observatory publications were issued and distributed, Vol. VII, No. 4, *Location of Epicentres, 1923-4-5*; Vol. VIII, No. 9, *Gravity in Western Canada*; Vol. IX, No. 6, *The Castor System*; Vol. IX, No. 7, *A Study of Eta Aquilae, Second Paper*; and Vol. X, Nos. 1, 2 and 3, *Bibliography of Seismology*.

The Bibliography of Seismology, issued quarterly as a publication of the observatory, takes the place of the *Bibliographical Bulletin*, formerly issued under the auspices of the eastern section of the Seismological Society of America, but compiled and edited at the observatory.

Dominion Astrophysical Observatory, Victoria, B.C.

This is the twelfth annual report of the work of this institution, which commenced actual operations on May 6, 1918. The details of the work are published in complete form in the publications of the observatory. Three volumes of these publications and fourteen numbers of Volume IV have been issued, while three more numbers are in press.

As in previous years, the whole time of the telescope, except two hours for visitors every Saturday evening, was devoted to photographing stellar spectra. The observing weather was considerably above the average even exceeding that of last year. The eleven-year average shows that on 207 nights with a total exposure time of 1,259.4 hours there were secured 1,558 plates. While the

number of plates secured in the past year, 1,133, is considerably fewer than the average, this is a necessary consequence of the investigations being carried to increasingly fainter stars which require longer exposure. A better index is the total observing time; on 223 nights during the past year the total was 1,497.1 hours, which is about 19 per cent above the average.

The investigation of all B type stars brighter than 7.50 and north of declination -11° which has been in progress since 1924 was completed during the year. This program involved the observation and measurement of 3,500 spectra of 550 stars. Following the completion of the manuscript for publication a general catalogue was compiled. This catalogue contains 1,560 entries for 996 stars; 458 of the stellar velocities (46 per cent) were determined solely at this institution, these being for stars fainter than 5.50.

Preliminary solutions for the K term and galactic rotation for the O and B type stars were made. It was found that the K term vanishes for stars fainter than the 6th magnitude. It seems likely that this hitherto unexplained term in radial velocity is caused by group motion of recession of the bright stars in the southern hemisphere—brighter than 5.50. The nearest group of stars B3-B5 brighter than 5.50 does not show a galactic rotation but the other more distant groups show a decided rotation about a distant centre in galactic longitude 326° in the direction of the constellation of Sagittarius. This research confirms the hypothesis of Lindblad and Oort.

The motions and distribution of the interstellar gases were determined from observations of the interstellar lines H and K in the spectra of 261 O to B2 stars. The determination of the sun's velocity and apex relative to the interstellar matter gave values in good agreement with the elements determined by Campbell for 2,149 naked-eye stars. The calcium cloud has no K term. The solutions for galactic rotation show conclusively that this diffuse interstellar matter is in rotation about the same distant centre in galactic longitude $332^\circ \pm 6^\circ$. Further by solving concurrently for the distances of the interstellar matter and the stars in whose spectra the lines are observed, it was shown that the interstellar matter is uniformly distributed throughout space. The rotational co-efficient for the stars has exactly twice the value of that for the clouds, thus confirming Eddington's hypothesis of uniform distribution.

Further solutions of the motions of the O and B type stars are now being made to deduce final values for the solar motion K term and galactic rotation.

About 450 spectra were secured during the year on the A-type program, among which number there were spectra of roughly 100 stars of which previously we had no spectrum. The remainder were additional plates for other stars. Slightly over 500 were measured during the year for radial velocity, a few having to do with spectroscopic binaries. We have now the spectra of about 1,100 A-type stars to be used later for spectroscopic parallax work.

The orbits of two A-type stars, Boss 613 and H.R. 3352, were completed during the year but not published. A revision of the elements of the binary 19 Draconis was made as recent observations suggested a slight correction to the period formerly adopted. A number of spectrograms of the B-type binary star H.D. 185936 were remeasured and a satisfactory period in the neighbourhood of 2.5 days deduced.

Observations of the eclipsing variable Y Cygni were continued. Calculations of the orbital elements for the years 1919-21 and for 1928-29 show clearly the rotation of periastron detected by other methods. Further the quantitative

agreement with the latest photometric results by Professor R. S. Dugan of Princeton is good, in view of the accuracy of the observation. A marked change was found in the velocity of the system, indicating the presence of a third body with a spectrum too faint to be observed.

Measurements were made of the radial velocities of 209 faint K stars near the galactic equator and 15 near the galactic pole. An analysis of the velocities giving the solar motion and galactic rotation effect for these stars agrees with the results derived by other astronomers from proper motion data. It is found that the peculiar velocities of these K stars are high (four have been observed greater than 100 km./sec.) and they show definite signs of stream motion. Observations are being continued in order to place these conclusions on a firmer basis.

A spectroscopic study of two semi-regular variables SV Ursae Majoris and V Ursae Minoris was commenced.

The program of observation of Wolf-Rayet stars, begun in the fall of 1927, was completed. Analysis of the complete data made it possible to formulate a theory concerning the physical nature of these peculiar objects. This theory attributes the broad band emission spectra of Wolf-Rayet stars to the continuous ejection of gaseous material from the stellar surface by selective radiation pressure. A new system of classification has been devised for the Wolf-Rayet stars which defines their position relative to other stars in the Harvard sequence.

An investigation of the physical nature of the variable star Z Ursae Majoris was begun and some 22 spectrograms of the star were obtained during the year.

A 10-foot grating spectrograph of Littrow form was completed and installed in the laboratory. This instrument has been used for the photometric determination of line intensities in laboratory spectra.

Many noted astronomers from all over the world visit the observatory from time to time. Including day visitors, approximately 39,000 persons visited the institution during the year.

SURVEYS BUREAU

All branches of survey work were actively prosecuted in the fiscal year 1929-30. The season was notable for the advance in the use of the aeroplane in all surveying fields, not only for the making of aerial photographs but for reconnaissance purposes and the transportation of ground survey parties.

Progress was made by the Geodetic Survey in the work of triangulation and levelling. In nearly all of the provinces work in the extension of triangulation nets and precise traverses was carried forward, and Laplace stations combining observations for latitude, longitude, and azimuth were established. The Levelling Division had field parties operating in the provinces of Quebec, Ontario, Manitoba, Saskatchewan, and British Columbia. The work of establishing precise level bench-marks throughout Canada was pushed forward energetically and nine publications were issued containing the record of the results throughout Canada. Geodetic research work was continued, and valuable data in the investigation of isostasy were secured.

The Topographical Survey continued its mapping program, including control surveys, aerial, ground, land-classification, and interprovincial boundary surveys, and surveys for determining magnetic declination. Eighteen parties

were in the field and new map sheets were issued covering over 100,000 square miles, of which over 70,000 square miles were covered by map sheets of the National Topographic Series. The facilities of the Physical Testing Laboratories are increasingly made use of both by Government departments and the public, in connection with the repairing and testing of scientific measuring and recording instruments.

The International Boundary Commission, Canadian Section, in conjunction with the United States Section was engaged in its work of maintaining the 5,500 miles of boundary between Canada and the United States in a state of effective demarcation. The vista in the Quebec-Maine section of the boundary was reopened, monuments were repaired, and the exact boundary marked on a number of international highways, bridges and tunnels. During the year fourteen boundary maps were printed and signed by the commissioners.

The Town Planning Division is the central educational agency for the promotion of town-planning practice throughout the Dominion, and contact is maintained with those centres where town-planning is in progress, or is being initiated, and the most up-to-date information is furnished relating to this work.

NATIONAL DEVELOPMENT BUREAU*

This bureau had a most active year along all its lines of endeavour.

Industrial Surveys.—As was the case last year, active co-operation was extended to boards of trade and other commercial and municipal organizations interested in industrial expansion. This work has now become a very important phase of the development studies carried on by the bureau. It comprises general and special investigations into the utilization of raw materials and products, and the initiation and direction of field surveys designed to indicate all latent possibilities for industrial expansion within specified areas. As regards the industrial surveys the policy formulated and adopted by the bureau provides for directing the formation, within the co-operating agencies concerned, of committees representative of the various commercial and social elements of the districts, for advising these in the matter of personnel, procedure, and other factors of importance which enter into the execution of the survey, and for such departmental assistance in the final analysis and correlation of the material as may be required.

During the year departmental co-operation was solicited by the boards of trade of Regina, Moose Jaw, Saskatoon, Prince Albert, Edmonton, Vancouver, New Westminster, Victoria, Calgary, Lethbridge, and Medicine Hat. In order that these as well as other interested bodies in Western Canada might be assured of the full benefit of departmental facilities in this work, a visit was made to the various districts by an officer of the bureau. This afforded the personal contacts essential to co-operation and enabled the leaders and members of the organizations concerned to receive first-hand information as to the scope and aims of industrial surveys. At each place complete explanations were given of the local organization involved, the nature and extent of the basic information required, the procedure that has been found to be most effective in collecting the material, and of the phases of the work in which departmental facilities could most effectively be utilized. As a result, industrial surveys were at once initiated in the Saskatoon, New Westminster, and Victoria areas in connection with which the Bureau undertook the work of

* Formerly designated Natural Resources Intelligence Service.

compilation, correlation, and analysis of the data collected in the field by the special committees, later combining these with related material available in Government departments at Ottawa. The preparation of a complete report was then placed in hand.

During the previous year a comprehensive industrial survey was made of the Border Cities district, comprising Windsor, Walkerville, Ford City, Riverside, Tecumseh, Sandwich, Ojibway, and La Salle. This was directed by the Bureau in co-operation with the Border Cities Chamber of Commerce and was followed by a report embodying a complete analysis of the established manufacturing industries in that area as well as an exposition of the possibilities of developing new industries. The Border Cities Chamber of Commerce has continued to use the facilities of the bureau in carrying out recommendations contained in that report. Visits were made also to London, Kitchener, Hamilton, and Niagara Falls, where the bureau has for some time been working in co-operation with the chambers of commerce or similar organizations in those cities.

By special request an officer of the bureau represented the department at Fort William Industrial Fair held in February. Advantage was taken of this visit by business men of the district to receive detailed explanations of departmental policy with respect to industrial surveys. As a result, tentative plans for the necessary surveys were at once formulated by the Board of Trade of that city as well as by the Chamber of Commerce of Port Arthur.

General Information Work.—The comprehensive index system maintained by the bureau provides a ready reference of up-to-date information on all phases of the development of Canada's natural resources. Record is kept of the continuous stream of development news reflecting the very latest operations throughout the country. The data, so assembled, are analysed and co-ordinated.

The many inquiries received during the year cover a wide range of resources and industrial subjects, and originate not only in this country but in a great number of cases are received from abroad from business men, investors, prospective settlers, editors, teachers, and others interested in the opportunities for development which Canada has to offer. In most instances comprehensive replies can be formulated at once from information on file, but many inquiries are of a nature which require special investigation and more protracted study. For instance, special investigations were made into definite phases of such subjects as the hydrogenation of fish oils, the manufacture of porcelain electric insulators, the utilization of waste parts of lobsters resulting from canning operations, opportunities for the manufacture of automatic forced draught machines for use in household furnaces, the possibilities of manufacturing blanc fixe in Canada, etc. In addition, upon request of boards of trade, chambers of commerce and other public service organizations in various sections of Canada, extensive reports were prepared covering the more or less local situations with respect to certain industries such as macaroni, leather, furniture, overalls, evaporated fruit, liquid chlorine, malt, brick, glue, hemp, soap, rubber tires, inside tile, coal pulverization, fish reduction, muskrat, silk, feeder cattle, and flour milling. Quite apart from the special co-operation which was extended to outside agencies, considerable progress was made in the routine study of development problems initiated by the Bureau, in connection with which a number of reports and maps were issued. *The Resources of New Brunswick*, one of a series of standard provincial reports, was revised, augmented by much new material, and printed. Also, in view of the remarkable expansion of industry along the St. Lawrence waterway and of the unprecedented interest in the

future of that area, the policy was adopted during the year of preparing separate reports of each contiguous district. Already much headway has been made in studies of the counties of southern Ontario and it is worthy of note that mimeographed reports of Dundas county and Hastings county recently issued have each been much in demand. Other mimeographed reports issued include *Opportunities for Settlers in Special Areas*, and *Peat and Its Industrial Applications*, the latter prepared in co-operation with the Department of Mines. The regular series of industrial maps was extended during the year to include tanneries, furniture factories, and wooden box, basket, and crate factories. The pulp and paper map was revised.

Because of the relatively large proportion of farm lands available in Canada, inquiries are very numerous concerning the possibilities for settlement in the various provinces. Land maps, cereal, elevator, physical and climatic, and vegetation and forest cover maps, and special reports, have been issued to facilitate handling the correspondence involved. The information conveyed by these media is necessary in dealing with ordinary requests, but considerable time and research is also devoted to the many inquiries which call for further study.

The domestication of fur-bearing animals has noticeably quickened interest in Canada's fur resources. This is reflected in the number of applications received for publications bearing on the subject of trapping practice as well as for information concerning the physical and economic aspects of fur-farming. The National Development Bureau has collected, classified and recorded a great mass of essential information on this important industry and has issued a number of reports which have proved to be very popular. During the year *The Muskrat: A Canadian Fur Resource* was printed, both in English and French. In addition there are now available in mimeographed form, monographs dealing with the domestication of practically all important fur-bearers.

Tourist Information.—Each year Canada becomes more widely known abroad, particularly among our neighbours to the south who in ever increasing numbers spend their vacations in this country. The actual economic influence exerted by this traffic is difficult to estimate, but is obviously of such importance as to warrant recognition as a major factor in Canadian development. The National Development Bureau put forth efforts to promote the traffic and to furnish information concerning our recreational resources. During the year inquiries included applications for particulars of automobile routes, condition of roads, camping trips, canoe trips, hiking tours, fishing and hunting trips, summer resorts, game laws, leasing of lakes, etc., and included also requests from tourists who had previously taken advantage of this service. Every endeavour is made to give the prospective tourist complete and authentic information. Tourist maps and booklets are revised periodically and supplemented as conditions warrant. During the year four booklets descriptive of the more interesting canoe trips in the Maritime Provinces, Quebec, Ontario, and in the western provinces were printed and several detailed descriptions of canoe trips were added to the lengthy list already available. Memoranda were prepared and issued in mimeographed form covering the better known hunting and fishing districts. The demand for the handbook, *Vacations in Canada*, was so great that a reprint was necessary.

Distribution of Publications.—During the year 829,379 maps, reports and booklets were distributed not only in Canada but also throughout Great Britain, the United States, and other countries. By this means co-operation was maintained with practically all organizations of importance in the different countries in touch with prospective tourists. These agencies assisted materially in circulating information about Canada either by direct distribution or by the advantageous display of reference maps, booklets, and folders.

Approximately 15,000 prospective delegates to international conventions held in Canada, of which there were seventy-five during the year, were supplied with road maps and booklets for the purpose of assisting them in planning their trips. Articles and reviews regarding Canada's attractions prepared by the Bureau were much in demand and appeared in newspapers and magazines in the United States, having a combined circulation of upwards of nine million copies. Publications distributed were utilized both by organizations and individuals, including a firm of ship brokers in Norway, interested in navigation problems of the Hudson Bay route; the geographer for the Institute of Politics which held a conference in Williamstown, Massachusetts, for the purpose of studying Canada-United States relations; a steamship company in Boston desiring material descriptive of Canadian tourist resorts for its offices in the tropics; an aircraft company planning a flight from Montreal to Vancouver; an organization in Ohio holding a "Canada" essay contest; a Chicago company interested in establishing a trans-Atlantic air service between that city and London via Hudson bay, Greenland, and Iceland; and the organizers of the American Ford Aircraft Reliability Tour.

Special Canadian News Service.—The *Canadian Newsletter* was issued weekly in English and French for distribution abroad. It comprises an average of over ten mimeographed pages of selected and condensed news describing the latest developments of resources and industries throughout Canada. It is distributed to Canadian ministers abroad, trade commissioners, newspapers and periodicals, technical journals, libraries, chambers of commerce, banks, investment houses, and industrial and commercial interests. The reissue by the High Commissioner's office in London of the items appearing in the newsletter greatly increases their circulation in the British Isles. The Canadian legations in Paris, Washington and Tokyo are important avenues for distribution. In connection with this news service every effort was made to accede to specific requests for more detailed articles and for suitable illustrations in the form of halftones, linecuts and photographs.

Geographic and Economic Mapping.—In the Chief Geographer's office considerable progress was made in the preparation and issue of the official maps of Canada. Seventeen sheets of Standard Geographic map series were revised and new editions of the following sheets were published: Belleville, Cape Breton, Cornwall, Gowganda, Halifax, Ottawa, Parry Sound, Quebec, Rivière du Loup, Yarmouth, and Sherbrooke, on a scale of 1 to 250,000; and Bonaventure, Gaspé, Gatineau, Roberval, Sudbury, and Victoria on a scale of 1 to 500,000. Much work was also done on the preparation of other sheets of this series. New revised editions of the Land District maps were issued, one for each of the nine land districts of the Prairie Provinces. The following maps were also revised and re-published: the small Railway map of Canada, 100 miles to the inch; Yukon Territory, 16 miles to the inch; Manitoba, Saskatchewan, and Alberta, each on a scale of 12½ miles to the inch; and sheet North L-18 of the Carte du Monde au Millionième was published. A number of large diagrammatic maps were specially prepared for lecture purposes. A base map of the province of Quebec was completed showing the Dominion electoral districts and giving also in detail all municipalities including towns, villages, parishes, and townships.

The importance of economic geography in relation to studies of national progress is recognized not only in educational spheres, but also in the fields of practical development. Again this year the Bureau carried out an extensive program of economic geography investigations as a result of which many of the regular series of economic maps were revised and a number of new maps initiated and issued or else placed in advanced stages of preparation. Included

are the Trade Routes map of the World; the Resources map of Canada, 230 miles to an inch; the Resources map of Canada, 100 miles to an inch; the Vegetation and Forest Cover map of Canada; a series of provincial resources maps; the United States-Canada Road maps series; map of the Prairie Provinces showing disposition of lands; and the Road and Recreational Resources map of New Brunswick. In addition, the facilities of the bureau were frequently taxed to the utmost in meeting the demands from the various branches of the federal and provincial Government services, as well as from geographical establishments, universities, industrial and financial interests, economists, authors, and publishers, for special maps portraying some phase of resources development.

Technical Plant.—The technical plant comprises photographic laboratories, blue printing, photostat, mimeographing, and related facilities. Established primarily to meet the varied needs of all branches of the Department of the Interior, other federal departments have increasingly made use of these services, with the result that all divisions of the plant experienced increased operations during the year. Photographs for reproduction purposes are much in demand by authors, publishers, syndicate newspaper services, chambers of commerce, trade commissioners, and other organizations at home and abroad, with the result that more than 9,500 photographs were distributed. The photographic library of the Bureau comprehensively covers all fields of development in Canada and is constantly kept up to date by the accession of new material. The lantern slide lecture service considerably increased its activities and new distributing centres were established. These lectures have proved to be of great educational value in depicting Canada's resources and attractions, and despite the fact that all standard sets have been duplicated many times these are practically in constant circulation. During the year 538 sets were distributed, the audiences totalling approximately 237,000 persons.

DISPOSITION of the Surveyed Areas in Manitoba, Saskatchewan and Alberta,
January 1, 1930.

Items	Manitoba	Saskatchewan	Alberta	Total
	acres	acres	acres	acres
Area under homestead (including military homesteads).....	8,418,040	30,356,200	21,003,220	59,777,460
Area under pre-emptions, purchased homesteads, sales, half-breed scrip, bounty grants, special grants, swamp lands transferred to province of Manitoba, etc.....	5,846,438	6,727,654	3,542,471	16,116,563
Area granted to railway companies.....	3,553,969	15,197,944	13,032,697	31,784,610
Area granted to Hudson's Bay Company.....	1,274,147	3,352,958	2,404,152	7,031,257
Area of School Land Endowment (one-eighteenth of area surveyed in sections).....	1,639,200	3,944,650	3,769,400	9,353,250
Area sold subject to reclamation by drainage.....	41,066	41,656	39,606	122,328
Area sold under irrigation system.....		42,812	273,969	316,781
Area under timber berths (leased).....	1,363,770	559,974	1,016,672	2,940,416
Area under grazing leases.....	74,486	3,492,827	3,246,478	6,813,791
Area of forest reserves and parks.....	2,477,400	6,535,000	17,745,700	26,758,100
Area reserved for forestry; parks; dairy farms (Manitoba) and pulpwood purposes (inside surveyed tract).....	1,950,000	1,104,000	1,192,000	4,246,000
Area of road allowances.....	977,638	1,468,830	1,291,376	3,737,844
Area of parish and river lots.....	529,367	84,701	121,263	735,331
Area of Indian reserves.....	485,440	1,193,405	1,347,657	3,026,502
Area of Indian reserves surrendered.....	78,311	370,686	228,208	677,205
Area of water-covered lands (inside surveyed tract).....	4,260,280	1,899,593	2,296,850	8,456,723
Area undisposed of (surveyed).....	2,781,000	2,945,000	13,553,000	19,279,000
Totals.....	34,687,252	79,317,890	86,104,719	201,173,161

STATEMENT of Lands Sales by Railway Companies Having Government Land Grants and by the Hudson's Bay Company

Year	Hudson's Bay Company		Canadian Pacific Railway Company		Manitoba South-western Colonization Railway Company		Qu'Appelle, Long Lake and Saskatchewan Railroad and Steamboat Company	
	acres	amount	acres	amount	acres	amount	acres	amount
		\$		\$		\$		\$
1893.....			93,184	295,288	14,164	57,559	1,603	
1894.....	7,526	48,225	43,155	131,628	6,312	280,003	640	
1895.....	4,341	23,209	55,453	176,950	5,623	22,330	2,391	
1896.....	9,299	52,410	66,624	220,360	21,254	88,568	286	
1897.....	10,784	53,277	135,681	431,095	63,800	634,644	2,524	
1898.....	62,000	310,000	242,135	757,792	106,473	363,982	22,534	
1899.....	56,875	274,625	261,832	814,857	58,019	199,558	61,030	178,517
1900.....	70,196	352,631	379,091	1,152,836	133,507	437,449	18,932	53,974
1901.....	82,308	399,804	339,985	1,046,665	59,749	214,953	22,266	74,810
1902.....	269,577	1,412,332	1,362,478	4,440,500	206,411	713,365	39,835	147,365
1903.....	330,046	1,939,804	2,260,722	8,472,250	250,372	699,210	843,900	1,476,900
1904.....	144,857	879,910	857,474	3,516,864	29,522	113,303		
1905.....	139,721	865,905	411,451	2,045,800	80,342	296,936		
1906.....	236,191	1,863,375	1,012,322	6,015,060	83,418	360,889		
1907*.....	69,158	742,221	851,083	4,817,682	3,051	22,645	1,353	16,789
1908.....	21,184	267,215	81,060	727,367	31,982	153,007	5,621	68,869
1909.....	25,449	288,836	29,331	383,390	10,396	84,845	27,662	380,371
1910.....	104,382	1,297,454	655,585	10,473,425	14,501	126,950	106,000	964,600
1911.....	267,058	3,747,768	715,095	10,372,661	20,313	284,859	113,533	1,237,204
1912.....	42,554	808,943	855,280	12,420,488	18,932	117,497	35,213	495,116
1913.....	53,581	1,128,806	447,158	6,348,352	2,768	48,639	15,895	255,399
1914.....	26,292	572,837	263,962	4,242,089	7,626	91,948	1,629	21,546
1915.....	16,400	306,550	151,262	2,496,872	489	5,508	1,292	19,118
1916.....	79,310	1,273,144	242,215	3,670,421	4,780	58,808	12,246	180,361
1917.....	254,941	4,234,244	405,764	6,612,040	12,470	165,245	21,533	331,596
1918.....	386,394	6,914,947	545,284	11,044,883	25,933	321,005	49,723	783,062
1919.....	285,561	4,978,950	602,555	10,580,669	5,289	67,214	33,838	527,670
1920.....	276,629	4,724,941	571,571	11,356,146	4,623	56,760	32,095	474,895
1921.....	178,301	3,037,369	275,636	5,898,994	1,518	20,058	11,432	160,472
1922.....	33,595	545,611	101,497	1,732,350	1,519	15,497	1,274	22,315
1923.....	24,976	366,257	83,485	1,248,968	373	5,107	1,122	17,000
1924.....	33,434	456,386	45,911	775,205	637	3,822	6,242	92,145
1925.....	84,758	1,117,618	91,295	1,602,524	1,701	13,890	1,925	28,571
1926.....	184,595	2,276,129	168,988	2,263,919	3,723	31,043	7,623	115,603
1927.....	282,670	3,414,539	249,497	2,979,958	3,695	27,043	9,985	142,968
1928.....	289,713	3,546,598	387,034	4,349,779	4,910	46,256	7,888	93,833
1929.....	289,903	3,349,574	447,594	4,902,593	8,266	61,134	5,393	73,201
1930.....	215,992	2,090,472	255,151	3,145,513	6,892	49,478	7,727	32,908
Totals.....	4,950,621	59,962,916	16,044,881	153,964,178	1,315,353	5,708,907	1,543,685	8,467,178

*Nine months to March 31.

STATEMENT of Lands Sales by Railway Companies Having Government Land Grants and by the Hudson's Bay Company—*Concluded*

Year	Calgary and Edmonton Railway Company		Canadian Northern Railway Company		Great Northwest Central Railway Company		Total		Average per acre for all Railways	
	acres	amount	acres	amount	acres	amount	acres	amount		
		\$		\$		\$		\$	\$	
1893....	11,260						120,211	352,847	2 93	
1894....	11,035						68,668	207,856	3 02	
1895....	46,815						114,713	222,489	1 94	
1896....	10,553						108,016	361,338	3 34	
1897....	9,436						222,225	719,016	3 23	
1898....	15,481						448,623	1,431,774	3 18	
1899....	24,738	53,335					462,494	1,520,792	3 28	
1900....	46,653	128,256					648,379	2,125,146	3 27	
1901....	116,719	352,037					621,027	2,088,269	3 36	
1902....	323,494	1,033,396					2,201,795	7,746,958	3 56	
1903....	231,800	909,600	183,736	631,503	128,435	522,490	4,229,011	14,651,757	3 46	
1904....	129,007	563,507	64,469	313,575	41,858	177,081	1,267,187	5,564,240	4 39	
1905....	109,191	512,898	231,707	1,221,469	17,593	103,564	990,005	5,046,572	5 09	
1906....	85,784	480,063	204,966	1,014,351	20,003	137,503	1,642,684	9,871,241	6 01	
1907*....	59,515	346,064	289,576	1,711,109	4,023	41,470	1,237,759	7,697,930	6 02	
1908....	8,606	75,644	196,946	1,746,504	1,294	13,855	346,693	3,052,461	8 80	
1909....	6,370	66,508				165	7,935	109,373	2,211,885	11 08
1910....	18,323	182,926	285,428	2,783,010	571	6,863	1,184,790	15,835,228	13 36	
1911....	11,820	116,231	277,414	3,336,797	1,438	27,417	1,406,651	19,122,937	13 59	
1912....	10,853	154,424	365,926	4,216,578	632	11,373	1,329,390	18,224,419	13 70	
1913....	4,155	44,212	182,491	2,009,642	1,601	32,105	707,149	9,867,155	13 95	
1914....	19,575	460,129	182,491	2,009,642			501,575	7,398,191	14 75	
1915....	23,042	444,018				316	6,956	192,801	3,279,031	17 01
1916....	11,689	172,033				4,646	81,182	354,886	5,435,949	15 32
1917....	33,821	573,875	17,796	298,938	8,829	141,439	755,154	12,357,377	16 25	
1918....	53,335	815,628	39,546	732,351	16,021	275,724	1,116,237	20,887,600	18 71	
1919....	31,774	479,496	65,110	1,261,963	14,530	252,774	1,038,657	18,148,736	17 47	
1920....	26,953	425,656	86,305	1,685,241	27,981	464,586	1,026,157	19,188,225	18 69	
1921....	11,681	191,928	69,934	1,455,319	5,123	96,616	553,630	10,860,756	19 61	
1922....	3,024	51,603	14,163	263,199	167	2,997	155,239	2,633,572	16 96	
1923....	1,013	15,552	11,214	190,112	1,120	21,638	123,303	1,864,364	15 12	
1924....	1,283	14,144	71,489	1,103,421	799	14,934	159,795	2,460,057	15 39	
1925....	8,499	132,504	56,981	770,680	2,246	35,151	247,405	3,700,938	14 95	
1926....	10,145	93,642	79,088	1,127,973	3,660	45,907	457,822	5,954,216	13 01	
1927....	8,658	96,799	107,511	1,586,850	4,463	47,531	666,479	8,295,685	12 45	
1928....	17,162	205,695	67,714	924,018	9,183	93,582	783,604	9,259,759	11 82	
1929....	17,628	199,975	83,507	1,189,833	7,478	82,378	859,769	9,858,688	11 46	
1930....	6,039	68,378	67,466	934,900	3,813	38,966	563,080	6,360,615	11 30	
Totals..	1,576,929	9,460,156	3,302,974	34,518,978	327,993	2,783,756	29,062,436	274,866,069	9 46	

*Nine months to March 31.

ACCOUNTS BRANCH

STATEMENT of Gross Cash Receipts from all Sources for the Fiscal Year 1929-30 Compared with the Receipts for the Previous Fiscal Year

Source of revenue	1929-30	1928-29	Increase	Decrease	Net decrease
	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.
Dominion lands.....	4,249,866 81	4,152,279 31	97,587 50		
School lands.....	2,291,191 71	2,661,392 34		370,200 63	
Ordinance lands.....	30,308 90	24,858 19	5,450 71		
Seed grain and relief.....	352,065 36	423,801 75		71,736 39	
Registrar's fees.....	608 59	553 49	55 10		
Fines and forfeitures.....	4,019 44	3,539 93	479 51		
Casual revenue.....	14,125 54	21,665 53		7,539 99	
	6,942,186 35	7,288,090 54	103,572 82	449,477 01	345,904 19

STATEMENT of Cash Receipts on Account of Dominion Lands Revenue for the Fiscal Year 1929-30 Compared with the Receipts for the Previous Fiscal Year

Particulars	1929-30		1928-29		Increase	Decrease	Net increase			
	\$	cts.	\$	cts.	\$	cts.	\$	cts.		
Homestead fees.....	175,080	00	161,890	00	13,190	00				
General sales.....	72,676	15	85,905	39			13,229	24		
Pre-emption sales.....	337,348	55	657,211	44			319,862	89		
Purchased homestead sales.....	15,099	36	29,489	30			14,389	94		
Improvements.....	57,501	26	65,461	51			7,960	25		
Patent and Interchange fees.....	190	25	245	15			54	90		
Rentals of land.....	61,326	14	27,502	43	33,823	71				
Map sales, office fees, etc.....	36,021	51	30,053	15	5,968	36				
Suspense account.....	831	87	1,969	09			1,137	22		
Liquor permit fees.....	897	00	723	00	174	00				
Trader's licences.....	9,065	00	6,588	67	2,476	33				
Trapper's licences.....	17,905	95	16,127	00	1,778	95				
Bird licences.....	55	00	25	00	30	00				
Marriage licences.....	2	00	2	00						
Fur sales.....	82,271	50	28,338	87	53,932	63				
Fur export tax.....	793	70	5	00	788	70				
Trading post licences.....	44	00	65	00			21	00		
Billiard licences.....	125	00	175	00			50	00		
Miscellaneous.....	16,307	30	9,003	66	7,303	64				
Taxidermists licences, etc.....	215	15	74	00	141	15				
Timber dues.....	1,131,024	43	1,395,725	57			264,701	14		
Grazing rental.....	156,753	53	162,548	40			5,794	87		
Grazing fees.....	5,934	96	8,463	20			2,528	24		
Grazing improvements.....	3,788	62	16,105	15			12,316	53		
Hay permits.....	14,320	63	9,195	62	5,125	01				
House rental.....	2,939	15	3,098	00			158	85		
Irrigation fees.....	545	50	537	50	8	00				
Irrigation sales.....	2,999	84	13,055	16			10,055	32		
Sale of trees, etc.....	21,406	08	16,927	92	4,478	16				
Fishing permits.....	2,401	20	1,968	30	432	90				
Ice permits.....	88	00	98	00			10	00		
Camping permits.....	341	00	122	00	219	00				
Rent of water-power.....	69,364	00	67,224	26	2,139	74				
Coal lands.....	414,248	05	421,759	95			7,511	90		
Mining fees.....	192,553	86	238,279	25			45,725	39		
Dredging leases.....	527	20	2,210	00			1,682	80		
Petroleum leases.....	1,047,994	37	391,855	98	656,138	39				
Hydraulic leases.....	2,817	34	3,988	29			1,170	95		
Quarrying leases.....	12,928	81	11,430	96	1,497	85				
Potash and alkali leases.....	4,052	52	2,031	87	2,020	65				
Tar sand leases.....	750	63	117	21	633	42				
Sand, stone and gravel permits.....	285	00	803	00			518	00		
Quartz leases.....	15,752	62	12,968	85	2,783	77				
Export tax on gold.....	16,574	25	16,366	79	207	46				
Free certificates for export of gold.....	3	50	4	50			1	00		
Antelope park.....	384	00	384	00						
Buffalo park.....	26,330	39	28,220	16			1,839	77		
Elk Island park.....	9,393	50	1,334	60	8,058	90				
Fort Anne park.....	1	00	6	00			5	00		
Glacier park.....	197	23	180	14	17	09				
Jasper park.....	35,122	72	29,942	39	5,180	33				
Lake Florence.....	66	00	60	00	6	00				
Point Pelee park.....	266	75	599	37			332	62		
Banff park.....	148,611	38	150,959	60			2,348	22		
Waterton Lakes park.....	6,442	82	5,484	08	958	74				
Yoho park.....	3,612	00	3,144	17	467	83				
Prince Albert park.....	594	73	379	77	214	96				
Kootenay park.....	14,431	51	13,729	64	701	87				
Brereton Lakes park.....	10	00	10	00						
Historic sites.....	30	00	33	00			3	00		
Vidal's Point recreational area.....	171	00	72	00	99	00				
	4,249,866	81	4,152,279	31	810,996	54	713,409	04		
Refunds.....	110,762	32	81,939	94	28,822	38				
Net totals.....	4,139,104	49	4,070,339	37	782,174	16	713,409	04	68,765	12

STATEMENT Showing Receipts on Account of Dominion Lands from July 1, 1872, to March 31, 1930.

Fiscal year	Homestead fees	Pre-emption fees	Improvements	Sales		Map sales, office and registration fees	Dominion Land Surveyors examination fees	Rents, survey fees, miscellaneous, and suspense account	Purchased, homestead inspection, cancellation and sundry fees	Timber dues
				Cash	Scip					
	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.
1872-73.....	6,960 00			19,170 20						109 25
1873-74.....	7,310 00			19,834 75				125 50		2,710 55
1874-75.....	11,510 00			13,666 90		129 00				2,335 25
1875-76.....	4,680 00			3,478 94	320 00					387 00
1876-77.....	2,250 00			1,085 86	136,955 16	4 00		100 00	40 00	320 00
1877-78.....	14,540 00			2,794 86	120,159 54		180 00		290 00	1,620 00
1878-79.....	17,690 00			4,998 39	210,904 84	81 00	310 00	13 70	410 00	325 00
1879-80.....	41,255 00	10,241 43		45,708 97	81,685 86	245 40	580 00	183 25	1,780 00	25,121 46
1880-81.....	20,450 00	10,801 75	269 00	71,170 17	70,828 30	985 40	420 00	37 58		32,028 34
1881-82.....	54,155 00	39,843 90	1,758 00	1,240,328 27	50,590 84	3,036 45	890 00	58 10		58,753 14
1882-83.....	73,015 00	54,725 00	7,114 91	516,092 21	33,638 40	3,109 50	890 00	501 77		90,066 46
1883-84.....	41,580 00	28,810 00	2,596 11	424,863 36	40,919 67	1,289 55	530 00	45,766 53	1,713 45	147,983 10
1884-85.....	25,645 00	17,100 00	2,328 75	199,275 32	45,875 60	1,621 82	370 00	50,068 57	2,685 00	87,474 99
1885-86.....	26,110 00	14,371 00	1,101 50	76,140 41	214,657 97	1,339 34	360 00	20,070 00	5,025 00	64,820 31
1886-87.....	19,614 00	6,887 93	1,971 55	48,175 76	337,640 19	1,171 39	240 00	44,561 00	7,778 40	65,111 74
1887-88.....	23,691 00	4,830 00	1,918 35	52,238 36	313,522 67	1,660 75	240 00	20,591 41	12,078 53	94,964 55
1888-89.....	39,460 00	10,550 00	4,128 48	57,513 16	318,238 57	1,410 16	220 00	10,389 57	20,402 50	90,290 00
1889-90.....	35,920 00	8,580 00	3,250 54	54,896 85	228,744 47	2,094 07	190 00	3,316 23	21,715 00	84,642 95
1890-91.....	29,164 10		6,302 61	91,664 98	171,125 14	1,854 78	88 00	7,951 05	16,790 00	102,902 71
1891-92.....	46,994 00		6,472 31	111,651 01	97,822 41	2,147 31	135 00	29,898 49	27,964 00	106,461 35
1892-93.....	37,689 74		7,113 50	96,171 67	77,231 18	975 20	82 00	18,509 35	22,015 50	105,865 24
1893-94.....	36,462 26		3,497 76	53,254 71	27,840 96	973 11		13,457 09	11,097 00	81,290 51
1894-95.....	29,664 88		3,567 90	37,293 71	23,269 62	695 99	40 00	6,271 77	6,566 90	74,079 20
1895-96.....	18,278 00		3,163 15	46,373 98	46,929 65	610 78	50 00	21,679 31	6,810 50	61,923 47
1896-97.....	21,179 00		3,737 01	49,335 53	16,929 38	795 05	70 00	11,129 72	8,527 50	68,992 82
1897-98.....	34,780 00		5,649 63	80,178 64	28,918 14	1,987 40	10 00	15,376 53	15,859 88	119,313 78
1898-99.....	58,235 00		4,297 62	116,594 35	21,307 58	1,266 05	20 00	67,450 95	20,850 40	155,360 63
1899-1900.....	72,690 00		4,835 81	103,247 58	88,756 22	1,258 85	190 00	31,154 04	21,688 00	126,345 82
1900-01.....	79,910 00		5,213 22	40,360 93	326,270 03	3,874 14	165 00	70,499 54	12,874 00	209,399 32
1901-02.....	144,425 00		8,481 46	66,950 21	169,767 13	5,792 96	370 00	71,993 30	663 00	207,790 90

1902-03.....	320,409 65		11,829 08	155,537 49	158,452 66	5,911 96	365 00	125,128 66	595 00	470,916 93
1903-04.....	255,772 36		15,119 47	196,750 15	189,705 08	5,549 13	463 50	81,246 46	1,081 00	397,344 33
1904-05.....	304,806 25		21,571 25	154,128 04	19,644 59	4,879 13	906 50	144,854 31	1,271 00	266,951 46
1905-06.....	417,834 25		31,795 19	442,588 69	7,654 57	6,042 34	474 00	141,345 30	1,046 25	292,681 53
1906-07 (9 months)...	215,449 55		39,763 63	503,202 44	11,349 89	5,449 06	620 00	60,450 99	685 00	379,476 32
1907-08.....	301,693 73		71,139 47	656,303 03	92,311 24	7,727 29	490 00	148,914 00	1,283 50	473,608 94
1908-09.....	389,039 00	141,550 15	70,928 86	951,442 28	20,136 27	7,296 55	1,040 00	75,596 96	9,579 50	269,837 52
1909-10.....	415,232 00	174,250 00	105,009 07	1,239,037 33	3,973 84	9,135 49	1,500 00	99,967 27	14,028 30	377,856 45
1910-11.....	445,135 00	156,485 00	143,227 13	1,193,756 04	1,437 84	8,730 01	1,310 00	42,111 92	20,142 85	387,054 96
1911-12.....	391,703 12	102,070 00	184,825 92	1,967,182 85	3,256 99	11,239 14	1,400 00	44,280 89	14,745 50	400,668 61
1912-13.....	337,055 00	85,940 00	168,904 42	1,650,491 87	6,157 27	14,483 91	1,040 00	17,866 65	11,380 00	463,738 75
1913-14.....	317,412 00	61,660 00	187,052 46	1,303,587 54	240 00	16,056 07	1,350 00	40,148 65	8,402 00	378,365 33
1914-15.....	238,295 00	28,720 00	114,982 17	696,672 23	80 00	14,290 23	970 60	33,234 14	4,776 10	310,934 29
1915-16.....	170,350 00	22,760 00	112,782 70	1,090,842 36		11,485 83	470 00	19,495 98	3,475 00	378,960 68
1916-17.....	112,110 20	14,600 00	112,711 33	2,707,203 99	332 61	13,976 95	560 00	21,212 91	2,910 00	429,403 09
1917-18.....	83,180 00	7,870 00	89,371 59	3,046,091 55	131 47	12,066 22	250 00	26,513 84	2,200 00	482,006 25
1918-19.....	42,190 00		43,225 97	2,192,860 81	323 41	11,039 54	100 00	77,291 91	360 00	408,728 28
1919-20.....	67,460 00		78,913 74	2,799,605 09	80 00	17,134 19	255 00	28,535 19	340 00	589,780 21
1920-21.....	53,880 00		70,492 66	1,721,171 61		16,333 67	200 00	23,149 23	370 00	705,313 77
1921-22.....	73,540 00		56,084 83	761,849 89		23,352 07	170 00	26,285 90	3,713 00	683,490 99
1922-23.....	53,460 00		36,847 94	414,278 96	900 00	21,414 16	180 00	20,848 43	6,187 40	825,465 05
1923-24.....	38,640 00		31,930 25	404,952 00	160 00	15,652 17	20 00	25,791 21	8,131 73	847,772 60
1924-25.....	36,590 00		37,738 73	410,221 58	611 80	16,115 57	10 00	28,637 37	17,072 05	981,399 60
1925-26.....	46,900 00		46,330 00	467,600 87		19,473 96		41,760 21	18,808 10	1,098,692 53
1926-27.....	57,700 00		53,409 35	544,873 59		28,774 45		35,150 25	22,640 90	1,190,974 61
1927-28.....	72,551 00		59,971 75	732,323 76		34,467 59		54,998 28	20,924 41	1,388,140 48
1928-29.....	161,890 00		81,566 66	785,661 29		30,053 15		69,912 05	23,955 82	1,395,725 57
1929-30.....	175,080 00		61,289 88	428,123 90	26 67	36,021 51		163,675 96	29,077 90	1,131,024 43
Totals.....	6,670,665 09	1,002,736 16	2,233,584 67	33,362,851 27	3,824,115 72	464,565 79	20,784 60	2,279,559 27	494,806 87	19,675,106 40

STATEMENT Showing Receipts on Account of Dominion Lands from July 1, 1872, to March 31, 1930—Continued

Fiscal year	Grazing lands		Hay, coal, mining fees, stone quarries, export tax on gold, etc.		National parks	Colonization lands		Gross revenue	Refunds	Net revenue
	Cash	scrip	Cash	scrip		Cash	scrip			
	\$ cts.	\$ cts.	\$ cts.	\$ cts.		\$ cts.	\$ cts.			
1872-73								26,239 45		26,239 45
1873-74								29,980 80		29,980 80
1874-75								27,641 15		27,641 15
1875-76								8,865 94		8,865 94
1876-77								140,755 02		140,755 02
1877-78								139,584 40		139,584 40
1878-79								234,732 93		234,732 93
1879-80								206,801 37	4,636 08	202,165 29
1880-81								206,990 54	5,038 22	201,952 32
1881-82	2,245 00		40 00			354,036 17		1,805,734 87	10,687 55	1,795,047 32
1882-83	22,844 43		913 91			248,492 01		1,051,403 60	8,746 05	1,042,657 55
1883-84	11,370 60		640 90			253,713 40		1,001,776 67	9,220 50	992,556 17
1884-85	17,089 75		815 63			1,214 22		451,564 65	12,070 85	439,493 80
1885-86	29,562 51	3,131 08	1,284 83					457,973 95	63,389 12	394,584 83
1886-87	14,242 77	39,487 67	1,570 40	80 00				588,532 80	19,543 16	568,989 64
1887-88	5,922 47	23,023 28	2,273 73	80 00	2,951 58		10,000 00	569,986 68	6,277 66	563,709 02
1888-89	2,207 69	16,802 63	3,946 55		2,528 73		16,000 00	594,088 04	5,226 23	588,861 81
1889-90	1,305 57	9,021 63	9,242 08		1,094 37			464,018 76	8,209 74	455,809 02
1890-91	3,079 55	16,193 77	8,628 44	160 00	2,397 35	5 28	4,460 50	463,068 26	7,195 27	455,872 99
1891-92	3,726 80	17,222 60	5,616 85		3,648 45			459,760 58	15,291 39	444,469 19
1892-93	6,380 80	11,542 39	6,266 13		4,983 23			394,825 93	18,314 97	376,510 96
1893-94	5,740 79	7,687 86	6,243 15		2,523 92			250,069 12	4,544 01	245,525 11
1894-95	5,353 72	8,628 00	5,229 54		2,321 87			202,983 10	4,365 99	198,617 11
1895-96	7,071 86	6,255 90	5,813 51		2,734 82			227,694 93	8,368 79	219,326 14
1896-97	4,715 01	2,500 00	8,633 68		2,132 11			198,676 81	6,833 78	191,843 03
1897-98	4,728 58	510 39	699,383 01		3,045 65			1,009,741 63	4,678 55	1,005,063 08
1898-99	5,245 88		1,130,705 70		2,994 16			1,584,328 32	32,296 39	1,552,031 93
1899-1900	8,382 86	4,083 30	1,038,362 92	20 00	2,727 65			1,503,743 05	23,062 28	1,480,680 77
1900-01	4,726 28	14,671 99	1,102,127 33	20 00	4,047 31			1,874,159 09	18,368 85	1,855,790 24
1901-02	7,292 46	8,409 27	737,882 43		*2,861 13			1,432,679 25	27,165 55	1,405,513 70
1902-03	13,911 73	15,041 33	607,723 65		*5,063 69			1,890,886 83	21,519 84	1,869,366 99
1903-04	19,790 27	13,921 29	495,583 18		*9,498 48			1,681,824 70	36,721 75	1,645,102 95

1904-05	36,145 32	5,237 36	364,927 59		*14,059 55		1,339,382 35	25,786 90	1,313,595 45	
1905-06	51,583 89	80 00	297,302 44		18,883 83		1,709,315 28	33,418 36	1,675,896 92	
1906-07 (9 months)	43,711 91	400 00	214,257 10		*15,887 42		1,490,503 31	35,117 48	1,455,385 83	
1907-08	43,211 78	4,048 01	266,415 31		27,232 87		2,094,579 17	115,080 04	1,979,499 13	
1908-09	53,312 79	3,257 84	253,339 17		31,321 20		2,277,678 09	102,463 78	2,175,214 31	
1909-10	67,807 01	5,081 47	459,870 29		43,697 61		3,022,446 13	121,431 15	2,901,014 98	
1910-11	60,702 80	2,356 00	774,569 27		69,054 59		3,306,073 41	198,689 47	3,107,383 94	
1911-12	69,519 41	1,520 00	729,126 56		56,497 74		3,978,036 73	197,631 35	3,780,405 38	
1912-13	79,412 76		779,695 53	1,587 32	37,448 72		3,655,202 20	246,105 76	3,409,096 94	
1913-14	84,926 15	320 00	865,499 12		48,800 33		3,313,819 65	277,309 33	3,036,510 32	
1914-15	101,710 58	400 00	1,594,905 42		37,895 97		3,177,866 73	317,764 75	2,860,101 98	
1915-16	118,955 02	160 00	476,408 82		37,493 53		2,443,639 92	143,942 57	2,299,697 35	
1916-17	128,341 50		600,934 13		45,851 45		4,190,233 16	134,243 14	4,055,995 02	
1917-18	125,300 69	240 00	630,427 95		52,160 52		4,557,810 08	113,680 44	4,444,129 64	
1918-19	148,179 55		630,975 74		55,006 72		3,616,281 93	76,031 02	3,540,250 91	
1919-20	183,661 96		896,413 40		76,742 07		4,738,920 85	116,149 03	4,622,671 82	
1920-21	183,756 97		1,234,558 49		76,850 09		4,086,076 49	130,750 93	3,955,325 56	
1921-22	144,344 67		1,071,395 56		74,302 68		2,918,529 59	119,079 88	2,799,450 01	
1922-23	153,697 11		823,183 50		75,304 59		2,431,767 14	83,151 71	2,348,615 43	
1923-24	141,871 05		723,762 59		115,163 42		2,353,847 02	71,983 13	2,281,863 90	
1924-25	149,070 38		639,749 23		176,650 46		2,493,866 77	102,880 70	2,390,986 07	
1925-26	166,387 97		793,357 73		180,886 12		2,880,197 49	76,684 27	2,803,513 22	
1926-27	162,096 89		1,084,694 72		238,239 19		3,418,553 95	91,280 73	3,327,273 22	
1927-28	161,044 56		963,64 14	480 00	275,342 59		3,763,408 56	74,333 97	3,689,074 59	
1928-29	171,011 60		1,197,890 25		234,612 92		4,152,279 31	81,939 94	4,070,339 37	
1929-30	162,688 49		1,816,954 56		245,930 18		4,249,893 48	110,762 32	4,139,131 16	
Totals	3,199,390 19	241,235 06	26,062,706 16	2,427 32	2,418,870 86	857,461 08	30,460 50	102,841,327 01	3,579,563 91	99,261,763 10

*Including scrip.

DEPARTMENT OF THE INTERIOR

STATEMENT Showing the Yearly Gross Cash Revenue from all Sources from April 1, 1910, to March 31, 1930

Fiscal Year	Dominion Lands	School Lands	Seed Grain	Ordinance Lands	Fires and Forfeitures
	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.
1910-11	3,302,279 57	1,614,733 93	153,351 14	6,009 34	4,052 22
1911-12	3,973,259 74	1,594,533 96	119,634 13	11,566 46	10,510 48
1912-13	3,647,457 61	1,621,508 11	171,342 87	60,607 80	7,150 35
1913-14	3,313,259 65	1,215,822 37	176,736 89	5,805 98	7,888 50
1914-15	3,177,386 73	943,717 00	68,263 56	4,416 64	5,828 00
1915-16	2,443,479 92	934,965 37	2,525,528 50	5,997 98	3,075 21
1916-17	4,189,905 55	1,699,370 00	3,652,729 00	5,553 26	2,184 72
1917-18	4,557,438 61	2,836,216 40	2,613,708 67	7,929 75	3,686 00
1918-19	3,615,958 52	5,087,875 81	1,378,275 76	4,819 27	35 00
1919-20	4,738,840 85	3,900,091 75	1,155,354 64	9,840 33	70 00
	36,959,266 75	21,448,834 76	12,014,925 21	122,546 81	44,480 48
1920-21	4,086,076 49	4,480,270 67	773,200 67	8,887 88	1,139 75
1921-22	2,918,529 59	2,335,726 83	372,350 89	8,446 48	2,912 73
1922-23	2,430,867 14	1,538,449 98	254,802 23	6,132 79	3,075 46
1923-24	2,353,687 02	1,511,518 09	274,227 20	57,505 97	2,467 55
1924-25	2,493,254 97	1,468,627 43	298,684 22	16,474 10	3,398 86
1925-26	2,880,197 49	2,052,415 11	309,646 01	13,045 18	2,613 87
1926-27	3,418,553 95	1,567,547 79	310,807 97	30,797 01	4,592 45
1927-28	3,762,928 56	2,085,300 76	313,193 83	14,221 02	3,622 98
1928-29	4,152,279 31	2,661,392 34	423,801 75	24,858 19	3,539 93
1929-30	4,249,866 81	2,291,191 71	352,065 30	30,308 90	4,094 44
	32,746,241 33	21,992,440 71	3,682,780 13	210,677 58	31,383 03
Increase		543,605 95		88,130 77	
Decrease	4,213,025 42		8,332,145 08		13,097 45

STATEMENT Showing the Yearly Gross Cash Revenue from all Sources from April 1, 1910, to March 31, 1930—Concluded

Fiscal year	Registration fees	Casual revenue	Chinese immigration revenue	Total
	\$ cts.	\$ cts.	\$ cts.	\$ cts.
1910-11	1,378 19	11,336 06		5,093,140 45
1911-12	1,066 05	32,824 65	971,339 00	6,714,734 47
1912-13	1,241 25	22,873 55	3,549,242 00	9,081,423 54
1913-14	966 50	27,884 47	2,644,593 00	7,392,957 36
1914-15	969 85	11,738 10	588,124 00	4,800,443 88
1915-16	908 15	28,002 62	19,389 00	5,961,346 75
1916-17	796 85	15,618 26	140,487 00	9,706,644 75
1917-18	562 25	9,074 15	336,757 00	10,365,372 83
1918-19	789 22	12,381 71		10,100,135 29
1919-20	430 78	22,837 87		9,827,466 22
	9,109 09	194,571 44	8,249,931 00	79,043,665 54
1920-21	448 31	811,970 45		10,161,994 22
1921-22	524 64	20,128 63		5,658,619 79
1922-23	454 00	20,060 18		4,253,841 78
1923-24	603 30	28,317 00		4,228,326 14
1924-25	334 12	20,079 55		4,300,853 25
1925-26	920 12	12,294 75		5,271,132 53
1926-27	453 19	42,139 86		5,374,892 28
1927-28	350 79	14,378 32		6,193,996 26
1928-29	553 49	21,665 53		7,288,090 54
1929-30	608 59	14,125 54		6,942,186 35
	5,250 55	1,005,159 81		59,673,933 14
Increase		810,588 37		
Decrease	3,858 54		8,249,931 00	19,369,732 40

Appended hereto are individual reports of the Commissioner of Dominion Lands; the Supervisory Mining Engineer; the Director of Forestry; the Commissioner, National Parks of Canada; the Director of Water Power and Reclamation; the Director of the North West Territories and Yukon Branch; and the Director General of Surveys. The Geodetic Survey, the Topographical Survey, the Water Power and Reclamation Service, the Forest Service, the National Parks of Canada Branch, and the North West Territories and Yukon Branch publish separate annual reports which review the work of the year in greater detail.

Your obedient servant,

W. W. CORY,
Deputy Minister.

November 1, 1930.

The report of the Timber and Land Division indicates an increase of over six million feet board measure of lumber manufactured, and five million feet board measure marketed. There was an increase of two hundred and thirty thousand head of livestock grazed on Dominion Government lease-holds which now cover an area of nearly seven and a quarter million acres. A general auction sale of school lands was held in the province of Saskatchewan, which was successful both as to the area disposed of and the price per acre realized. In the provinces of Alberta and Manitoba small auction sales were held comprising chiefly lands which had previously been sold under the area disposed of with values realized were as follows:

Province	Area (Acres)	Value (\$)
Alberta	1,200,000	1,200,000
Manitoba	800,000	800,000

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I

DOMINION LANDS

REPORT OF THE COMMISSIONER, J. W. MARTIN

An interesting feature of the transactions for the fiscal year, so far as Dominion lands were concerned, was the large number of homestead entries recorded, showing an advance over 1928-29 when there was also an exceptional increase. The entries granted totalled 17,504 as compared with 16,157 for the previous year, an increase of 1,347. Included in these entries were 4,952 second homesteads granted to settlers who had completed the duties in connection with their first homesteads by January 1, 1925, an increase of 261 as compared with the previous fiscal year. In addition to the homestead entries there were taken up 720 soldier grants, aggregating an approximate area of 115,200 acres.

Applications for patent were as follows:—

Number examined.....	5,845
New applications.....	3,188
Applications accepted and notifications issued.....	2,356
Certificates of recommendation sent out.....	39

Since the inauguration of the Seed Grain and Relief Adjustment Boards of the provinces of Manitoba, Saskatchewan, and Alberta, under the legislation authorizing the adjustment or apportionment of seed grain, fodder, and relief indebtedness, there have been submitted to the various boards for investigation and recommendation some four thousand cases. Of this number about 1,900 have been finally dealt with by Order in Council, and a large proportion of these were disposed of during the last fiscal year. The open accounts covering Dominion advances and joint advances with the provinces number approximately 22,000, many of which may ultimately have to be disposed of through adjustment.

The report of the Timber and Grazing Lands Division indicates an increase of over sixty million feet board measure of lumber manufactured, and five million feet board measure marketed. There was an increase of over eighty-six thousand head of livestock grazed on Dominion Government leaseholds which now cover an area of nearly seven and a quarter million acres.

A general auction sale of school lands was held in the province of Saskatchewan, which was successful both as to the area disposed of and the price per acre realized. In the provinces of Alberta and Manitoba small auction sales were held comprising chiefly lands which had previously been held under sale.

The areas disposed of, with values realized, were as follows:—

Province	Area in acres	Amount realized		Average price per acre	
		\$	cts.	\$	cts.
Saskatchewan.....	371,309 79	5,426,479	95	14	62
Alberta.....	28,373 27	342,504	35	12	07
Manitoba.....	4,198 15	49,738	29	11	85

The revenue derived from the disposal of mining rights on Dominion lands increased considerably during the past fiscal year. This increase was due to the interest manifested in leases issued for petroleum and natural gas purposes, principally in the province of Alberta. During the year the Department commenced the collection of royalty on oil produced from wells drilled on Dominion lands. The royalty provisions came into force on January 1, 1930, and during the months of January, February, and March over \$33,000 was collected on this account. The number of producing wells has increased, and the total oil production from Dominion lands in the fiscal year was nearly one million barrels. The records of the Mining Lands Division show that there was an increase in production of coal, petroleum, natural gas, and gold from Dominion lands in the Prairie Provinces, and of silver and lead in Yukon Territory.

Following up the report of the Royal Commission which conducted an inquiry into the financial adjustments involved in the proposed transfer to Manitoba of its natural resources, an agreement between the Dominion and the province of Manitoba was concluded on December 14, 1929, under which the interest of the Crown in all Crown lands, mines, minerals, and royalties, and all sums due or payable for such lands, mines, minerals or royalties, were declared to belong to the province and the administration thereof was declared to be transferred to the province from and after the coming into force of the said agreement. Similar agreements have also been entered into with the provinces of Saskatchewan, Alberta, and British Columbia.

It is expected that the governments of the western provinces will take over the administration of the natural resources within their respective boundaries during the coming fiscal year.

REPORT OF ASSISTANT COMMISSIONER OF DOMINION LANDS, EDMONTON

Reports of Agencies

Agency	Homestead entries granted	Land sales	Applications for patent received	Land entries cancelled	Permits issued	
		Ordinary and school lands			Timber	Hay
<i>Manitoba—</i>						
Dauphin.....	432	14	177	193	411	467
*The Pas.....						
Winnipeg.....	295	81	142	605		
<i>Saskatchewan—</i>						
Moose Jaw.....	1,216	153	751	533	41	438
Prince Albert.....	4,873	167	845	1,992	1,026	881
<i>Alberta—</i>						
Calgary.....	409	68	115	295	242	104
†Cold Lake.....						
Edmonton.....	4,600	210	521	2,018	2,289	713
Grande Prairie.....	2,293	127	128	854	618	129
Lethbridge.....	222	71	74	98	11	6
Peace River.....	3,058	50	151	1,617	787	250
<i>British Columbia—</i>						
Kamloops.....	37	15	32	59	399	
Revelstoke.....	26	3	18	22	257	
New Westminster.....	36	36	29	35	195	

NOTE.—Owing to the fact that adjustments are being made from day to day (including restoration of cancelled entries and sales in some cases, and in other cases disallowance of entries reported by the various agents), these figures can only be taken as indicating approximately the business transacted at each agency.

*The Pas office is that of a Mining Recorder, who is also Sub-Agent. The returns from this office for the fiscal year were as follows: Mining locations 1,104; assessments, 36; rentals, 247.

†The Cold Lake office is that of a Mining Recorder. The returns from this office for the fiscal year were as follows:—Mining locations, 456; assessments, 6; maps, 261; searches, 687; rentals, 3.

HOMESTEAD INSPECTORS, PRINCIPAL WORK PERFORMED BY

Headquarters	Name	Land inspections made	Applications for patent	Miles travelled	
				Wagon	Rail
<i>Manitoba—</i>					
Dauphin.....	W. S. Gordon.....	190		7,787	5,617
".....	W. J. Mayberry.....	554	64	10,267	1,943
".....	Geo. L. Speers.....	386	109	4,083	9,165
Winnipeg.....	J. F. Drew.....	366	47	6,703	10,677
".....	W. H. Gray.....	441	33	6,828	9,371
".....	A. B. Jacobs.....	60		8,452	6,287
".....	E. A. Koons.....	190		9,317	7,561
".....	*A. W. Love.....	73		602	2,220
".....	*Gust Mager.....	34		918	1,114
".....	F. L. Morton.....	429	57	5,773	9,713
".....	J. H. Thompson.....	172		6,007	6,713
".....	W. H. Wardrop.....	318		7,760	3,829
".....	W. A. Willets.....	205		2,937	6,043
".....	Thos. P. Williams.....	320		3,982	9,026½
<i>Saskatchewan—</i>					
Moose Jaw.....	C. E. Barr.....	1,619	24	12,204	34
".....	F. J. Bigg.....	1,046	18	10,522	1,087
".....	W. A. Brown.....	901	25	11,451	582
".....	J. C. deBalinhard.....	734	56	15,850	3,589
".....	J. Furnis.....	495	4	8,967	138
".....	*E. L. J. Jaycock.....	951	15	12,864	841
".....	F. M. Lambert.....	843	43	9,752	663
".....	G. H. Lydiard.....	1,569	10	16,031	1,412
".....	T. M. Morgan.....	601	5	7,661	1,022
".....	T. A. Underwood.....	1,736	29	18,268	1,297
Prince Albert.....	*F. Cummings.....	463	3	5,396	2,426
".....	*H. J. Dorrance.....	400	75	4,515	3,962
".....	H. A. Gleeson.....	489	47	12,444	4,002
".....	A. E. Mosses.....	951	43	17,632	2,633
".....	Fred McKenzie.....	650	50	8,337	3,516
".....	S. Taylor.....	577	21	11,485	1,541
".....	E.H.E. Webb-Bowen.....	682	69	5,871	3,054
".....	W. W. Whelan.....	701	20	11,961	1,770
<i>Alberta—</i>					
Calgary.....	*R. A. Kembry.....	642	7	11,643	2,155
".....	D. H. Minchin.....	334	11	8,422	1,447
".....	Jas. Nurcombe.....	1,753	32	15,027	4,009½
".....	H. B. Stickney.....	862	8	13,419	1,132
".....	Wm. Tempany.....	772	12	18,661	474
Edmonton.....	W. E. Bristow.....	164		7,953	3,250
".....	I. S. Doze.....	328	26	4,188	3,957
".....	J. P. Duggan.....	387	40	3,531	3,580
".....	D. A. McKay.....	370	3	3,801	6,465
".....	*J. E. McMullen.....	51		792	905
".....	A. McMillan.....	288	2	16,592	3,702
".....	*J. D. McMillan.....	92	5	1,371	945
".....	J. F. McLeod.....	377		11,130	2,609
".....	H. S. McCowan.....	382	2	13,537	272
".....	F. W. Neilson.....	456	22	4,701	2,682
".....	A. Sullivan.....	567	35	10,220	2,723
".....	R. S. Wyllie.....	321	20	12,982	622
Grande Prairie.....	T. M. Newton.....	544	30	13,601	
".....	L. T. Smith.....	705	35	15,567	350
Lethbridge.....	H. L. Bowyer.....	440		11,546	1,180
".....	D. E. Wilcox.....	1,180	19	13,793	1,146
Peace River.....	S. Grimwood.....	538	24	11,271	2,107
".....	D. S. Hayden.....	435	8	10,014	1,732
<i>British Columbia—</i>					
Kamloops.....	J. M. Benzie.....	413	23	6,392	1,438
".....	P. C. Campbell.....	377		8,082	1,195
Revelstoke.....	†Henry Cook.....				
".....	W. E. Smith.....	120	5	5,823	4,735

*Homestead Inspector employed for portion of year only.

†Henry Cook absent all year on sick leave.

REVENUES COLLECTED AT DOMINION LAND AGENCIES CLASSIFIED UNDER THE VARIOUS HEADINGS

Agency	Agent	Land Patents	Timber and Grazing	Reclamation Service
		Division	Division	
		\$ cts.	\$ cts.	\$ cts.
<i>Manitoba—</i>				
Winnipeg.....	L. P. O. Noel.....	7,724 84	885 24	194 22
Dauphin.....	E. Widmeyer.....	6,443 17	14,898 04	.....
<i>Saskatchewan—</i>				
Moose Jaw.....	J. A. Reid.....	293,621 88	58,639 30	956 59
Prince Albert.....	L. C. Paterson.....	80,506 26	130,158 27	56 70
<i>Alberta—</i>				
Lethbridge.....	E. F. Layton.....	48,941 66	40,034 47	50 15
Calgary.....	E. H. Crockett.....	26,571 66	63,430 74	54 49
Edmonton.....	A. Norquay.....	67,734 33	252,434 17	696 63
Grande Prairie.....	H. W. Clarke.....	28,589 12	6,084 93	.....
Peace River.....	R. Cruickshank.....	38,278 25	6,823 41	.....
<i>British Columbia—</i>				
Kamloops.....	H. J. Parker.....	2,955 86	85,269 44	.....
Revelstoke.....	T. J. Wadman.....	941 81	30,722 47	.....
New Westminster.....	E. Walmsley.....	9,206 83	298,737 18	.....

REVENUE COLLECTED AT DOMINION LAND AGENCIES (Concluded)

Agency	Agent	Mining Lands	School Lands	Miscellaneous	Total
		Division	Division		
		\$ cts.	\$ cts.	\$ cts.	\$ cts.
<i>Manitoba—</i>					
Winnipeg.....	L. P. O. Noel.....	48,927 51	3,207 38	1,482 34	62,421 53
Dauphin.....	E. Widmeyer.....	7,896 71	2,481 93	39 45	31,759 30
<i>Saskatchewan—</i>					
Moose Jaw.....	J. A. Reid.....	17,337 55	120,394 69	157,115 62	648,065 63
Prince Albert.....	L. C. Paterson.....	26,386 88	34,956 28	8,519 84	280,584 23
<i>Alberta—</i>					
Lethbridge.....	E. F. Layton.....	323,925 85	46,459 03	9,676 39	469,087 55
Calgary.....	E. H. Crockett.....	636,902 11	102,397 94	2,365 16	831,722 10
Edmonton.....	A. Norquay.....	254,437 30	47,185 49	1,737 32	624,225 24
Grande Prairie.....	H. W. Clarke.....	270 90	25,940 58	1,062 53	61,948 06
Peace River.....	R. Cruickshank.....	5,088 45	1,316 09	258 95	51,765 15
<i>British Columbia—</i>					
Kamloops.....	H. J. Parker.....	3,080 13	.....	.....	91,305 43
Revelstoke.....	T. J. Wadman.....	57 50	.....	.....	31,721 78
New Westminster.....	E. Walmsley.....	8,276 11	.....	.....	316,220 12

Land Patents

LETTERS PATENT

During the fiscal year ended March 31, 1930, there were 5,997 letters patent issued, covering a total area of 832,665 acres, divided according to provinces as follows:—

Province	Patents	Acres
Manitoba.....	604	81,898
Saskatchewan.....	2,621	376,784
Alberta.....	2,338	349,240
British Columbia.....	425	24,558
Yukon Territory.....	2	180
Northwest Territories.....	7	5
Totals.....	5,997	832,665

The various kinds of grants are summarized below and are later dealt with in detail in statements A to G, inclusive:—

	Grants	Patents	Acres
Homesteads.....		2,164	330,611
Sales.....		957	99,808
Pre-emptions.....		432	68,718
Purchased homesteads.....		42	5,476
Railways.....		457	21,686
Special grants.....		1,409	199,638
Northwest half-breed grants.....		29	3,635
Licences of occupation.....		3	2
Soldier grants.....		328	50,287
Hudson's Bay Company grants.....		175	52,802
Manitoba Act grants.....		1	2
Totals.....		5,997	832,665

There was a decrease of eighteen letters patent and a decrease in the area patented of 112,539 acres, as compared with the previous year.

Since May, 1873, there have been issued 491,454 letters patent, aggregating an area of 107,126,520 acres. Those issued since July, 1883, are of record in the Land Patents and Records Division, and number about 476,357.

LANDS DISPOSED OF

Seventeen thousand five hundred and four (17,504) homestead entries (including 4,952 second homesteads) were granted, aggregating an approximate area of 2,800,640 acres, made up by provinces as follows: Manitoba, 727; Saskatchewan, 6,089; Alberta, 9,795; British Columbia, 893; total, 17,504.

There was an increase of 1,347 in the number of homestead entries granted as compared with the previous year.

By land agencies the 17,504 homestead entries are made up as follows:—

Manitoba.—Dauphin, 432; Winnipeg, 295; total, 727.

Saskatchewan.—Moose Jaw, 1,216; Prince Albert, 4,873; total, 6,089.

Alberta.—Calgary, 410; Edmonton, 4,603; Grande Prairie, 1,801; Lethbridge, 222; Peace River, 2,759; total, 9,795.

British Columbia.—Grande Prairie, 492; Kamloops, 37; New Westminster, 36; Peace River, 302; Revelstoke, 26; total, 893.

The 17,504 homestead entries represented 50,406 persons as compiled from information obtained from each entrant. Of these entries 3,750 were made by residents of the several provinces of the Dominion; 2,066 by persons who had previously obtained homestead entries which had been cancelled by default or at the request of the entrant, in order, in most cases, that he might enter for other lands; 1,049 were made by persons from the British Isles; 1,294 by persons from the United States; 450 by Austrians; 208 by Hungarians; 460 by Russians; 43 by Finlanders; 364 by Norwegians; 38 by Swiss; 34 by Frenchmen; 24 by Belgians; 240 by Swedes; 495 by Germans; 101 by Roumanians; 1,384 by Poles; 179 by Danes; 373 by citizens of various other countries and 4,952 were second homesteads.

There were 720 soldier grant entries made during the year, aggregating approximately 115,200 acres made up as follows:—

	Number of entries	Acres
Manitoba.....	19	3,040
Saskatchewan.....	224	35,840
Alberta.....	422	67,520
British Columbia (Railway Belt and Peace River Block).....	55	8,800
Totals.....	720	115,200

By land agencies the soldier grants were as follows:—

Manitoba.—Dauphin, 7; Winnipeg, 12; total, 19.

Saskatchewan.—Moose Jaw, 52; Prince Albert, 172; total, 224.

Alberta.—Calgary, 24; Edmonton, 164; Grande Prairie, 94; Lethbridge, 3; Peace River, 137; total, 422.

British Columbia.—(Railway Belt and Peace River Block) Grande Prairie, 30; Kamloops, 2; New Westminster, 7; Peace River, 12; Revelstoke, 4; total, 55.

There were 4,952 second homestead entries made during the year, aggregating approximately 792,320 acres, made up as follows:—

	Number of entries	Acres
Manitoba.....	182	29,120
Saskatchewan.....	2,061	329,760
Alberta.....	2,470	395,200
British Columbia (Railway Belt and Peace River Block).....	239	38,240
Totals.....	4,952	792,320

By land agencies the 4,952 second homestead entries are made up as follows:—

Manitoba.—Dauphin, 107; Winnipeg, 75; total, 182.

Saskatchewan.—Moose Jaw, 626; Prince Albert, 1,435; total, 2,061.

Alberta.—Lethbridge, 121; Calgary, 202; Edmonton, 1,090; Grande Prairie, 471; Peace River, 586; total, 2,470.

British Columbia.—Grande Prairie, 138; Peace River, 73; Revelstoke, 7; Kamloops, 15; New Westminster, 6; total, 239.

CANCELLED ENTRIES

There were cancelled 8,042 entries as follows:—

	Manitoba	Saskat- chewan	Alberta	British Columbia
Homesteads.....	552	2,261	3,823	202
Soldier grant entries.....	153	199	365	29
Pre-emptions.....		177	177	
Purchased homesteads.....		19	10	
Sales.....	7	24	39	5
Totals.....	712	2,680	4,414	236

Value of improvements collected on cancelled homesteads: 762 refunds, \$41,447.81.

NEWLY SURVEYED LANDS THROWN OPEN TO HOMESTEAD ENTRY

Newly surveyed lands comprised in 37 townships were made available for homestead entry as follows:—

Manitoba.—Dauphin, in 4 townships.

Saskatchewan.—Moose Jaw, in 1 township; Prince Albert, in 2 townships; total, 3 townships.

Alberta.—Peace River, in 6 townships; Edmonton, in 1 township; Grande Prairie, in 21 townships; total, 28 townships.

British Columbia.—Grande Prairie, in 2 townships.

STATEMENT A—Letters patent issued covering Dominion Lands in Manitoba, Saskatchewan, Alberta, Northwest Territories, British Columbia and Yukon Territory

No.	Nature of Grant	From April 1, 1929 to March 31, 1930		From April 1, 1928 to March 31, 1929	
		Patents	Acres	Patents	Acres
1	British Columbia homesteads.....	73	6,254	121	11,400
2	British Columbia sales.....	13	757	13	167
3	Drainage sales.....	7	389	12	609
4	Forestry sales.....	4	34		
5	Homesteads.....	2,065	320,258	2,058	317,974
6	Homesteads, Peace River Block.....	25	3,939	27	4,225
7	Hudson's Bay Co.....	175	52,802	112	29,865
8	Licences of occupation.....	3	2	3	9
9	Manitoba Act grant.....	1	2		
10	Military bounty grants.....				
11	Military homesteads.....			2	320
12	Mining lands sales.....			2	621
13	Northwest half-breed grants.....	29	3,635	28	5,346
14	Ordinance land sale.....	1	4		
15	Parish sales.....	1	114	1	
16	Pre-emption sales.....	432	68,718	710	112,364
17	Purchased homesteads.....	42	5,476	58	8,444
18	Quit claim, drainage sales.....			1	127
19	Quit claim, sales.....			6	253
20	Quit claim, special grants.....	72		53	242
	Railways—				
21	Alberta and Great Waterways.....			1	3
22	Calgary and Edmonton Railway (minerals only).....	101			
23	Canadian National Railway.....	12	139		
24	Canadian Northern Railway.....	35	11,312	206	95,330
25	Canadian Northern Alberta Railway.....	2	24		
26	Canadian Northern Pacific Railway.....	102	1,926		
27	Canadian Northern Western Railway.....	7	156		
28	Canadian Pacific Railway.....	178	3,720	45	709
29	Canadian Pacific Railway, subsidy grant.....	1	136		
30	Canadian Pacific Railway road-bed and sta- tion grounds.....			3	158
31	Central Canada Railway.....	3	14		
32	Grand Trunk Pacific Railway.....	4	58		
33	Kettle Valley Railway.....	1	5		
34	Lacombe and North Western Railway.....			1	6
35	Manitoba Northern Railway.....	2	34		
36	Manitoba and South Eastern Railway.....	8	4,156		
37	Manitoba South-Western Colonization Rail- way.....	1	6		
38	Sales.....	278	18,708	196	12,164
39	Sales, Peace River Block.....	4	174	2	143
40	School lands sales.....	648	79,608	543	74,151
41	Soldier grants.....	317	48,580	350	53,558
42	Soldier grants, Peace River Block.....	11	1,707	16	2,513
43	Special grants.....	1,290	194,987	1,417	211,894
44	Special grants (minerals only, 160 acres).....			1	
45	Special grants, Peace River Block.....	29	4,651	16	2,561
46	Special grants (timber only, 3,709 acres).....	18		3	
47	Yukon Territory homesteads.....	1	160		
48	Yukon Territory sales.....	1	20	5	11
49	Yukon Territory special grants.....			1	
	Totals.....	5,997	832,665	6,015	945,204

STATEMENT B—Letters patent issued covering Dominion Lands in Manitoba

No.	Nature of Grant	From April 1, 1929 to March 31, 1930		From April 1, 1928 to March 31, 1929	
		Patents	Acres	Patents	Acres
1	Homesteads.....	203	30,269	273	40,744
2	Hudson's Bay Co.....	2	648		
3	Manitoba Act grant.....	1	2		
4	Mining lands sales.....			2	97
5	Parish sales.....	1	114	1	
6	Quit claim, sales.....			3	168
7	Quit claim, special grants.....	6		40	160
	Railways—				
8	Canadian National Railway.....	1	10		
9	Canadian Northern Railway.....	1	3		
10	Canadian Pacific Railway.....	28	110	1	1
11	Canadian Pacific Railway road-bed and station grounds.....			1	2
12	Manitoba Northern Railway.....	2	34		
13	Manitoba South Western Colonization Railway.....	1	6		
14	Sales.....	36	1,283	42	1,615
15	School lands sales.....	21	2,545	26	3,496
16	Soldier grants.....	45	7,022	53	8,265
17	Special grants.....	256	39,852	117	18,007
	Totals.....	604	81,898	559	72,555

STATEMENT C—Letters patent issued covering Dominion Lands in Saskatchewan

No.	Nature of Grant	From April 1, 1929 to March 31, 1930		From April 1, 1928 to March 31, 1929	
		Patents	Acres	Patents	Acres
1	Drainage sales.....	1	23	6	239
2	Forestry sales.....	1	2		
3	Homesteads.....	1,158	180,471	1,096	169,274
4	Hudson's Bay Co.....	6	1,798	10	2,715
5	Licences of occupation.....	3	2	2	8
6	Military bounty grants.....			2	320
7	Military homesteads.....			1	302
8	Northwest half-breed grants.....	28	3,595	28	5,346
9	Pre-emption sales.....	366	58,168	585	92,508
10	Purchased homesteads.....	27	3,945	46	7,220
11	Quit claim, sales.....			1	48
12	Quit claim, special grants.....	49			
	Railways—				
13	Canadian National Railway.....	1	6		
14	Canadian Northern Railway.....	24	6,879	206	95,330
15	Canadian Pacific Railway.....	17	287		
16	Canadian Pacific Railway, subsidy grant.....	1	136		
17	Manitoba and South Eastern Railway.....	8	4,156		
18	Sales.....	104	5,072	62	3,283
19	School lands sales.....	345	41,467	278	38,382
20	Soldier grants.....	169	26,575	174	27,464
21	Special grants.....	313	44,202	662	95,174
	Totals.....	2,621	376,784	3,159	537,613

DEPARTMENT OF THE INTERIOR

STATEMENT D—Letters patent issued covering Dominion Lands in Alberta

No.	Nature of Grant	From April 1, 1929 to March 31, 1930		From April 1, 1928 to March 31, 1929	
		Patents	Acres	Patents	Acres
1	Drainage sales.....	6	366	6	370
2	Forestry sales.....	2	30		
3	Homesteads.....	704	109,518	689	107,956
4	Hudson's Bay Co.....	167	50,356	102	27,150
5	Licences of occupation.....			1	1
6	Military homesteads.....			1	319
7	Northwest half-breed grants.....	1	40		
8	Pre-emption sales.....	66	10,550	125	19,856
9	Purchased homesteads.....	9	1,429	7	1,127
10	Quit claim, drainage sales.....			1	127
11	Quit claim, sales.....			2	37
12	Quit claim, special grants.....	17		13	82
Railways:					
13	Alberta and Great Waterways Railway.....			1	3
14	Calgary and Edmonton Railway (minerals only).....	101			
15	Canadian National Railway.....	9	114		
16	Canadian Northern Railway.....	10	4,430		
17	Canadian Northern Alberta Railway.....	2	24		
18	Canadian Northern Western Railway.....	7	156		
19	Canadian Pacific Railway.....	15	287		
20	Central Canada Railway.....	3	14		
21	Grand Trunk Pacific Railway.....	4	58		
22	Lacombe and North Western Railway.....			1	6
23	Sales.....	131	12,348	89	7,204
24	School lands sales.....	282	35,596	239	32,273
25	Soldier grants.....	94	14,297	104	16,091
26	Special grants.....	708	109,627	614	96,099
27	Special grants (minerals only, 160 acres).....			1	
Totals.....		2,338	349,240	1,996	308,701

STATEMENT E—Letters patent issued covering Dominion Lands in British Columbia

No.	Nature of Grant	From April 1, 1929 to March 31, 1930		From April 1, 1928 to March 31, 1929	
		Patents	Acres	Patents	Acres
1	British Columbia homesteads.....	73	6,254	121	11,400
2	British Columbia sales.....	13	757	13	167
3	Forestry sales.....	1	2		
4	Homesteads, Peace River Block.....	25	3,939	27	4,225
5	Ordinance land sale.....	1	4		
6	Purchased homesteads.....	6	102	5	97
Railways—					
7	Canadian National Railway.....	1	9		
8	Canadian Northern Pacific Railway.....	102	1,926		
9	Canadian Pacific Railway.....	118	3,036	44	708
10	Canadian Pacific Railway road-bed and sta- tion grounds.....			2	156
11	Kettle Valley Railway.....	1	5		
12	Sales, Peace River Block.....	4	174	2	143
13	Soldier grants.....	9	686	19	1,738
14	Soldier grants, Peace River Block.....	11	1,707	16	2,513
15	Special grants.....	13	1,306	24	2,614
16	Special grants, Peace River Block.....	29	4,651	16	2,561
17	Special grants (timber only, 3,709 acres).....	18		3	
Totals.....		425	24,558	292	26,322

STATEMENTS F AND G—Letters patent issued covering Dominion Lands

F—IN YUKON TERRITORY

No.	Nature of Grant	From April 1, 1929 to March 31, 1930		From April 1, 1928 to March 31, 1929	
		Patents	Acres	Patents	Acres
1	Yukon Territory homesteads.....	1	160		
2	Yukon Territory sales.....	1	20	5	11
3	Yukon Territory special grants.....			1	
	Totals.....	2	180	6	11

G—IN THE NORTHWEST TERRITORIES

No.	Nature of grant	From April 1, 1929 to March 31, 1930		From April 1, 1928 to March 31, 1929	
		Patents	Acres	Patents	Acres
1	Sales.....	7	5	3	2

STATEMENT H—Number of Homestead Entries made during the Fiscal Year 1929-30, ending March 31, 1930, the Nationality of the Homesteaders and the Provinces in which the entries were made

Country of origin	Provinces				Total	Country of origin	Provinces				Total
	Manitoba	Saskatchewan	Alberta	British Columbia			Manitoba	Saskatchewan	Alberta	British Columbia	
Canada—						Brought forward.....	455	3,228	5,865	618	10,177
Yukon Territory.....			3		3	Russia.....	17	170	269	4	460
Ontario.....	27	313	391	86	817	Bermuda.....		1			1
Quebec.....	9	132	316	11	468	Argentine Republic.....		1	2		3
Nova Scotia.....	2	33	48	9	92	Bulgaria.....		1	2		3
New Brunswick.....	2	14	26	2	44	China.....			2		2
Prince Edward Island.....	2	24	18	3	47	Japan.....			1		1
Manitoba.....	150	238	248	34	670	Arabia.....		1			1
Saskatchewan.....	9	578	253	42	882	Australia.....		1	1		2
Alberta.....	1	47	576	39	663	New Zealand.....			1		1
British Columbia.....		8	35	21	64	India.....	1	1	1	1	4
Persons who had previous entry.....	78	525	1,368	95	2,066	West Indies.....			4		4
Newfoundland.....		4	8		12	Greece.....			1		1
United States.....	21	422	768	83	1,294	Poland.....	48	334	994	8	1,384
England.....	18	224	375	62	679	Finland.....	1	4	34	4	43
Scotland.....	6	78	114	26	224	Free City of Danzig.....		1			1
Ireland.....	1	41	89	15	146	Czecho-Slovakia.....	10	25	80	11	126
France.....	2	9	23		34	Hungary.....	11	120	75	2	208
Belgium.....	2	9	13		24	Jugo-Slavia.....	1	7	31	2	41
Switzerland.....		10	22	6	38	Wales.....		13	38	3	54
Italy.....		3	14	1	18	Esthonia.....		1	3		4
Roumania.....	2	29	67	3	101	Assyria.....	1	2			3
Syria.....	1		1		2	Lithuania.....		7	14		21
Germany.....	10	227	253	5	495	Central America.....			1		1
Austria.....	99	142	202	7	450	Mauritius Islands.....			1		1
Holland.....	1	8	41	2	52	Mexico.....			1		1
Denmark.....	1	31	137	10	179	Luxembourg.....			1		1
Iceland.....	3	5			8	Straits Settlement.....			1		1
Sweden.....	6	73	144	17	240	Africa.....			2	1	3
Norway.....	2	111	212	39	364	Second Homesteads.....	182	2,061	2,470	239	4,952
Carried forward.....	455	3,228	5,865	618	10,177	Total.....	727	6,089	9,795	893	17,504

Number of souls represented by above entries, 50,406.

12 552.

STATEMENT I—Number of Homestead Entries made in the Provinces of Manitoba, Saskatchewan, Alberta and British Columbia during the Fiscal Year by persons coming from the United States

State	Provinces				Total	State	Provinces				Total
	Manitoba	Saskatchewan	Alberta	British Columbia			Manitoba	Saskatchewan	Alberta	British Columbia	
						Brought forward.....	12	221	382	45	660
Alabama.....			1		1	Minnesota.....	2	99	131	16	248
Alaska.....				1	1	Mississippi.....		2	3	1	6
Arizona.....		1	1		2	Missouri.....	1	4	19	3	27
Arkansas.....				1	1	Montana.....	1	11	23	1	36
California.....		3	2	1	6	Nebraska.....		6	30	2	38
Carolina, North.....			2		2	Nevada.....					1
Colorado.....		4	9	1	14	New Hampshire.....		7	2		9
Connecticut.....		1	1		2	New Jersey.....					2
Dakota, North.....	4	103	102	15	24	New York.....		8	15		23
Dakota, South.....	1	21	55	3	80	Ohio.....	1	3	17	2	23
Florida.....			1		1	Oklahoma.....	1	7	16	3	27
Georgia.....		1	1		2	Oregon.....		3	18		21
Idaho.....	1	1	14	1	17	Pennsylvania.....		7	8	2	17
Illinois.....	1	19	31	2	53	Rhode Island.....			6		6
Indiana.....	1	5	13	2	21	Tennessee.....			5		5
Iowa.....	2	18	47	8	75	Texas.....		3	7	1	11
Kansas.....	1	8	30	1	40	Vermont.....		3	1	1	5
Kentucky.....		2	3	1	6	Virginia.....		1	2		3
Louisiana.....			1		1	Virginia, West.....		1	3		4
Maine.....	1	3	9	1	14	Washington.....	1	5	32	2	40
Massachusetts.....		9	17	2	28	Wisconsin.....	1	29	41	4	75
Michigan.....		21	39	6	66	Wyoming.....	1		6		7
Carried forward.....	12	221	38	45	660	Total.....	21	422	768	83	1,294

STATEMENT J—Number of Homestead Entries made during the Fiscal Year, as compared with the previous Fiscal Year

Agency	Manitoba		Saskatchewan		Alberta		British Columbia		Total
	1929-30	1928-29	1929-30	1928-29	1929-30	1928-29	1929-30	1928-29	
Calgary.....					410	545			
Dauphin.....	432	338							
Edmonton.....					4,603	3,646			
Grande Prairie.....					1,801	1,916	492	352	
Kamloops.....							37	23	
Lethbridge.....					222	297			
Moose Jaw.....			1,216	1,611					
New Westminster.....							36	55	
Peace River.....					2,759	2,529	302	323	
Prince Albert.....			4,873	4,197					
Revelstoke.....							26	20	
Winnipeg.....	295	305							
Fiscal year 1929-1930.....									17,504
Fiscal year 1928-1929.....									16,157
Net increase.....									1,347
Total.....	727	643	6,089	5,808	9,795	8,933	893	773	

STATEMENT K—Number of Soldier Entries made during the Fiscal Year, as compared with the previous Fiscal Year

Agency	Manitoba		Saskatchewan		Alberta		British Columbia		Total
	1929-30	1928-29	1929-30	1928-29	1929-30	1928-29	1929-30	1928-29	
Calgary.....					24	34			
Dauphin.....	7	6							
Edmonton.....					164	143			
Grande Prairie.....					94	95	30	24	
Kamloops.....							2	3	
Lethbridge.....					3	4			
Moose Jaw.....			52	93					
New Westminster.....							7	2	
Peace River.....					137	137	12	21	
Prince Albert.....			172	156					
Revelstoke.....							4	2	
Winnipeg.....	12	22							
Fiscal year 1929-1930.....									720
Fiscal year 1928-1929.....									742
Net decrease.....									22
Totals.....	19	28	224	249	422	413	55	52	

School Lands

During the fiscal year ended March 31, 1930, school lands were disposed of by public auction and private sale in the provinces of Manitoba, Saskatchewan, and Alberta as follows:—

MANITOBA

How disposed of	Area in acres	Sale price	Average per acre
		\$ cts.	\$ cts.
By public auction.....	4,198.15	49,738 29	11 85
By private sale in accordance with provisions of Dominion Lands Act.....	32.82	664 90	20 26
Totals.....	4,230.97	50,403 19	11 91

SASKATCHEWAN

By public auction.....	371,309.79	5,426,479 95 ¹	14 62
By private sale in accordance with provisions of Dominion Lands Act.....	700.94	8,873 75	12 66
Total.....	372,010.73	5,435,353 70	14 61

ALBERTA

By public auction.....	28,373.27	342,504 35	12 07
By private sale in accordance with provisions of Dominion Lands Act.....	303.66	3,488 08	11 49
Total.....	28,676.93	345,992 43	12 06

¹Includes the sale price of 103 town lots—\$5,330.

After making the necessary deductions for cancelled sales and adjustments in regard to alterations in areas, the approximate net areas and values of school lands and town lots disposed of to March 31, 1930, were as follows:—

Province	Area in acres	Sale price		Average per acre		Sale price of town lots	
		\$	cts.	\$	cts.	\$	cts.
Manitoba.....	635,480.74	6,101,913	80	9	60	5,240	00
Saskatchewan.....	2,119,796.68	33,198,820	73	15	66	17,976	00
Alberta.....	1,234,647.53	17,554,966	53	14	22	39,765	00

The number of permits and leases issued, the number of leases in good standing, and the combined revenue derived therefrom for the provinces of Manitoba, Saskatchewan, and Alberta for the fiscal year were as follows:—

—	Permits issued	Leases issued	Leases in good standing	Revenue derived	
				\$	cts.
Grazing.....	5,329			60,362	12
Cultivation.....	365			19,357	82
Hay.....	1,410			3,832	34
Timber.....	385			26,300	30
Coal.....		13	76	20,377	49
Petroleum and natural gas.....		168	1,064	101,864	17
Special.....		2	38	847	50

Registration Fees.—During the fiscal year 705 assignments of sales and leases were registered, comprising lands in the provinces of Manitoba, Saskatchewan, and Alberta. The fees amounted to \$2,591.45.

REVENUE AND EXPENDITURE STATEMENTS

The total net revenue collected for the fiscal year was as follows:—

Manitoba.....	\$ 35,321	31
Saskatchewan.....	1,413,230	16
Alberta.....	812,214	31
	<u>\$ 2,260,765</u>	<u>78</u>

The revenues collected for the fiscal year (less principal moneys and less expenditure) and paid to the provinces of Manitoba, Saskatchewan, and Alberta, were as follows:—

Province	Revenue other than principal moneys		Expenditure		Amount paid to province	
	\$	cts.	\$	cts.	\$	cts.
Manitoba.....	18,517	52	18,446	37		87
Saskatchewan.....	358,298	15	54,762	40	303,535	75
Alberta.....	449,070	48	37,086	69	411,983	77

The balance standing to the credit of the School Lands Fund for each province as on March 31, 1930, and the interest paid on the investment for the fiscal year 1929-30 were as follows:—

Province	Total amount at credit of fund	Amount invested in debenture stock	Interest paid on investments
	\$ cts.	\$ cts.	\$ cts.
Manitoba.....	5,905,584 82	5,905,000 00	294,525 00
Saskatchewan.....	17,724,632 89	17,724,000 00	853,225 00
Alberta.....	9,500,822 68	9,500,000 00	459,175 00

Statements herewith lettered A, B, and C respectively show the revenue collected from each of the provinces of Manitoba, Saskatchewan, and Alberta for the fiscal year, duly classified.

Statements herewith lettered D, E, and F respectively show the balance standing to the credit of the School Lands Fund for each province as on March 31, 1930, after deducting amounts landed in debenture stock as provided for by Order in Council.

STATEMENT A—Manitoba School Lands—Revenue collected for fiscal year

Source	Gross totals		Refunds	Net totals
	\$ cts.	\$ cts.	\$ cts.	\$ cts.
Sales—Principal.....		16,895 56	4 59	16,890 97
Interest.....		7,465 83		7,465 83
Cultivation.....	1,471 00			
Less office fees transferred to Dominion Lands....	27 00	1,444 00	82 50	1,361 50
Grazing.....	2,684 26			
Less office fees transferred to Dominion Lands....	296 00	2,388 26	55 43	2,332 83
Timber.....	5,543 68			
Less office fees transferred to Dominion Lands....	120 00	5,423 68	804 34	4,619 34
Hay.....	2,364 99			
Less office fees transferred to Dominion Lands....	545 00	1,819 99	71 75	1,748 24
Petroleum and natural gas.....		531 00	306 00	225 00
Registration fees.....		19 00		19 00
Miscellaneous.....		863 60	205 00	658 60
Totals.....		36,850 92	1,529 61	35,321 31

STATEMENT B—Saskatchewan School Lands—Revenue collected for fiscal year

Source	Gross totals		Refunds		Net totals	
	\$	cts.	\$	cts.	\$	cts.
Sales—Principal.....	1,081,992	89				
Less adjustments.....	1,901	77				
Interest.....	284,888	37				
Add adjustments.....	1,655	94				
Cultivation.....	16,568	96				
Less office fees transferred to Dominion Lands.....	290	00				
Grazing.....	40,397	15				
Less office fees transferred to Dominion Lands.....	3,338	00				
Timber.....	2,909	66				
Less office fees transferred to Dominion Lands.....	164	00				
Hay.....	2,012	00				
Less office fees transferred to Dominion Lands.....	557	00				
Coal.....						
Petroleum and natural gas.....						
Registration fees.....						
Miscellaneous.....	5,988	04				
Less office fees transferred to Dominion Lands.....	1	00				
Less adjustments.....	6	25				
Totals.....	1,434,177	52	20,947	36	1,413,230	16

STATEMENT C—Alberta School Lands—Revenue collected for fiscal year

Source	Gross totals		Refunds		Net totals	
	\$	cts.	\$	cts.	\$	cts.
Sales—Principal.....	377,855	16				
Less adjustments.....	720	01				
Interest.....	271,131	94				
Add adjustments.....	979	09				
Cultivation.....	2,711	53				
Less office fees transferred to Dominion Lands.....	48	00				
Grazing.....	23,051	31				
Less office fees transferred to Dominion Lands.....	1,695	00				
Timber.....	19,799	57				
Less office fees transferred to Dominion Lands.....	101	00				
Hay.....	1,040	10				
Less office fees transferred to Dominion Lands.....	308	00				
Coal.....						
Petroleum and natural gas.....						
Registration fees.....						
Miscellaneous.....						
Less office fees transferred to Dominion Lands.....						
Totals.....	820,163	27	7,948	96	812,214	31

STATEMENT D—Revenue and Expenditure—Manitoba School Lands, 1929-30

Particulars	Dr.		Cr.	
	\$	cts.	\$	cts.
By balance April 1, 1929.....				709 88
“ sales.....			24,356	80
“ cultivation permits.....			1,361	50
“ timber dues, hay dues, grazing rent, coal, petroleum and miscellaneous.....			9,584	01
“ registration fees.....			19	00
“ interest on fund.....			87	18
To cost of management at Ottawa.....	13,123	79		
“ outside salaries, printing and stationery, advertising and general expenses.....	5,322	58		
“ interest paid to Manitoba Government.....	87	18		
“ investments in debenture stock.....	17,000	00		
“ balance March 31, 1930.....	584	82		
Totals.....	36,118	37	36,118	37

STATEMENT E—Revenue and Expenditure—Saskatchewan School Lands, 1929-30

Particulars	Dr.		Cr.	
	\$	cts.	\$	cts.
By balance on April 1, 1929.....				1,177 08
“ sales.....			1,363,622	34
“ cultivation permits.....			15,536	21
“ timber dues, hay dues, grazing rent, coal, petroleum and miscellaneous.....			33,279	81
“ registration fees.....			791	80
“ interest on fund.....			23,523	80
To cost of management at Ottawa.....	39,371	31		
“ outside salaries, printing and stationery, advertising and general expenses.....	15,391	09		
“ revenue and interest paid to Saskatchewan Government.....	303,535	75		
“ investments in debenture stock.....	1,079,000	00		
“ balance March 31, 1930.....	632	89		
Totals.....	1,437,931	04	1,437,931	04

STATEMENT F—Revenue and Expenditure—Alberta School Lands, 1929-30

Particulars	Dr.		Cr.	
	\$	cts.	\$	cts.
By balance on April 1, 1929.....				536 28
“ sales.....			648,299	14
“ cultivation permits.....			2,460	11
“ timber dues, hay dues, grazing rent, coal, petroleum and miscellaneous.....			159,674	41
“ registration fees.....			1,780	65
“ interest on fund.....			13,142	57
To cost of management at Ottawa.....	26,247	50		
“ outside salaries, printing and stationery, advertising and general expenses.....	10,839	19		
“ revenue and interest paid to Alberta Government.....	411,983	79		
“ investments in debenture stock.....	376,000	00		
“ balance on March 31, 1930.....	822	68		
Totals.....	825,893	16	825,893	16

Mining Lands

In all probability the fiscal year ending March 31, 1930, will be the last that the annual report of the Mining Lands Division will cover the activities for twelve months with respect to the disposal of mining rights in the three Prairie Provinces and in connection with certain minerals in the Railway Belt and Peace River Block, province of British Columbia, due to the enactment of legislation providing for the transfer of the administration of these resources to the respective provinces.

The greatest activity during the past fiscal year, so far as the disposal of mining rights is concerned, was in connection with petroleum and natural gas leases, particularly in the province of Alberta, but the mining of coal still holds first place as regards production of minerals. The preliminary figures show that there were 7,728,453 tons of coal mined in the West, outside of British Columbia, during the calendar year 1929.

The Central Manitoba Mines Limited continued operations of their mine and mill in central Manitoba. During the year 1930 part of the metallurgical works of the Hudson's Bay Mining and Smelting Company, operating the Flin Flon mine, will be in operation.

The aeroplane was again used extensively for prospecting and exploring purposes by several mining companies engaged in the search for new prospects in the Northwest Territories, and extensive development work was carried on by one company on a group of mineral claims situated south of Great Slave lake. There are also indications that some of the iron deposits on the islands in Hudson Bay may be thoroughly tested in the near future.

In Yukon Territory there have been produced by means of placer mining operations 43,433.80 ounces of gold, and from ores the production was 2,510,334.10 ounces of silver and 8,678,120 pounds of lead. The total value of the mineral production in Yukon Territory for the fiscal year is estimated at \$3,154,316.06. For this purpose the placer gold was valued at \$20 per ounce. The one concentrating mill in operation in Yukon Territory, which is operated by the Treadwell Yukon Company, Limited, and which is situated in the Mayo district, was in continuous operation during the year.

All mineral rights alienated under the provisions of the existing mining regulations have been disposed of by lease or permit only for limited periods of time, and such rights are not now sold. The sources of revenue of this branch are confined to fees, rentals and royalties, and from these several sources there was collected during the fiscal year the sum of \$1,638,597.74, an increase of \$585,016.06 over the previous year.

Under the provisions of the Petroleum and Natural Gas Regulations, expenditures incurred in actual development on areas acquired under lease may be accepted in satisfaction of rentals, which should otherwise be paid in cash, and under this provision, rentals due to the Crown, amounting to \$532,142.27 were satisfied by such expenditures, and so reduced the revenue of the branch to that extent. The total revenue in cash, together with expenditures accepted in lieu of rental, amounted to \$2,170,740.01 during the year.

The provision of the regulations for the disposal at auction of petroleum and natural gas rights in areas comprised in cancelled leases, has resulted up to date in the payment to the Crown of the sum of \$199,031.62 on account of bonus, of which amount the sum of \$151,731.97 was collected during the last fiscal year.

That portion of the revenue of Yukon Territory derived from mining rights only, including the export tax on gold shipped from Yukon Territory, amounted to \$67,723.30.

Petroleum and Natural Gas.—There are now in force 16,139 petroleum and natural gas leases affecting Dominion lands, and embracing a total area of 2,169,102.33 acres; distributed as follows: In Manitoba, 49 leases, comprising 14,057 acres; in Saskatchewan, 109 leases, comprising 14,832 acres; in Alberta, 15,950 leases, comprising 2,129,490 acres; in British Columbia, 26 leases, comprising 6,670 acres; and in the Northwest Territories, 5 leases, comprising 4,053.33 acres.

Petroleum prospecting permits to the number of 164 have been issued, comprising 74,748 acres, and of these 125 permits were issued during the fiscal year under review.

The collection of royalty was commenced on January 1, 1930, and since that date to the end of the fiscal year the sum of \$33,854.64 was paid on this account. The number of petroleum and natural gas leases issued during the last fiscal year was 9,139, comprising a total area of 1,098,577 acres, and the total revenue from this source for the year amounted to \$1,047,994.37.

There have been issued, since the regulations governing the leasing of petroleum and natural gas rights were established, 50,357 leases. The total revenue which has been derived from this source since the beginning, has amounted to \$7,039,843.99, and the total expenditure which has been accepted in lieu of rental during the same period was \$4,129,850.63. On lands leased from the Crown 540 wells have been drilled to depth for the discovery of oil and gas. In the province of Alberta there have been produced during the year 903,337 barrels of oil from wells situated on Dominion lands. Many of the localities of Alberta, including the cities of Edmonton, Calgary, Lethbridge, and Medicine Hat, are supplied with natural gas produced from areas, most of which have been leased under the provisions of the regulations established by this Department.

Coal.—Prior to the year 1906 coal mining rights were disposed of by sale, at a price varying from seven to ten dollars an acre, and subject to the payment of a royalty of ten cents per ton on the quantity of coal mined, which royalty, however, has since been reduced to seven cents per ton. Such rights have since been disposed of by terminable lease, at a rental of one dollar an acre per annum and a royalty at the rate of five cents per ton. The area of coal mining rights disposed of up to 1906 by sale was approximately 245,070 acres, and the total revenue which was collected from the sale of such rights was \$1,565,833.88. The total number of coal mining leases in force at the close of the fiscal year was 693, comprising a total area of 241,909 acres, distributed as follows: Alberta, 609 leases, comprising 233,884 acres; Saskatchewan, 79 leases, comprising 4,145 acres; British Columbia, 3 leases, comprising 3,740 acres; Yukon Territory, 1 lease, comprising 40 acres; and Northwest Territories, 1 lease, comprising 100 acres. The total number of coal mining leases issued during the year was 101, comprising 27,161 acres, and the total revenue collected during the year for rental of such rights was \$158,901.54.

The following statement shows the amounts which have been collected on account of royalty on coal mined from lands in the western provinces, the Northwest Territories and Yukon Territory, respectively, during each of the past twenty three years:—

Year	Alberta	Saskat- chewan	British Columbia	Yukon Territory	Northwest Territories
	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.
1907-1908	7,621 67	4 30	Nil	1,543 38	Nil
1908-1909	5,322 39	358 11	"	371 73	"
1909-1910	153,559 98	1,672 50	3 00	136 38	"
1910-1911	218,932 88	2,184 74	3 50	125 00	"
1911-1912	104,894 55	2,034 74	2 78	390 00	"
1912-1913	142,997 79	3,145 72	6 95	1,069 11	"
1913-1914	147,198 75	2,123 43	19 35	Nil	"
1914-1915	104,489 77	1,880 06	4 90	"	"
1915-1916	67,190 17	2,601 52	3 50	"	5 10
1916-1917	149,447 82	2,228 08	8 92	"	Nil
1917-1918	144,634 75	4,046 55	Nil	"	6 00
1918-1919	175,687 66	3,193 05	"	"	Nil
1919-1920	181,641 80	2,573 32	"	"	"
1920-1921	190,545 80	2,703 41	"	"	"
1921-1922	185,436 88	3,309 86	"	"	"
1922-1923	171,723 83	3,035 18	"	"	"
1923-1924	210,389 53	1,689 45	"	"	"
1924-1925	148,979 10	2,421 11	7 50	"	1 50
1925-1926	188,277 94	3,024 94	Nil	"	2 00
1926-1927	218,150 10	4,726 93	"	"	3 50
1927-1928	231,757 96	7,589 18	"	"	2 20
1928-1929	254,616 27	5,322 75	12 75	"	2 80
1929-1930	248,083 71	7,259 65	Nil	"	3 15

The total revenue derived from fees, rentals and royalties collected in connection with coal mining rights during the year amounted to \$414,248.05.

Quartz and Placer Mining.—Placer mining claims are held under yearly lease, subject to an annual expenditure in development work. Quartz mining claims are similarly held until development has sufficiently progressed and the claim has been surveyed under proper instructions, when a lease is issued for a continuous period of twenty-one years, subject to royalty only.

During the year, entries were granted for 4,759 quartz mining claims, of which number 3,721 were for claims in the western provinces, for the most part in Manitoba. Entries were also granted for 110 placer mining claims staked and applied for during the year, and 1,894 such claims, previously acquired, were renewed for another year.

Final leases have been granted for 1,247 mineral claims, comprising a total area of 61,354.62 acres, of which number 218 leases were issued during the fiscal year, comprising an area of 8,660.33 acres.

In the Mayo district of Yukon Territory, where the Treadwell Yukon Company, Limited, operates a concentrating mill, this company shipped 6,909.49 tons of ore and concentrates. Only ore containing values in the neighbourhood of \$200 per ton is shipped. The report of the Gold Commissioner indicates that there was an increase in the production from ores mined in the Mayo district during the year, and it is expected that over ten thousand tons of ore will be shipped during the year 1930.

Quarrying.—Under the Quarrying Regulations, which provide for the disposal of Dominion lands containing limestone, granite, slate, marble, gypsum, marl, gravel, sand, clay, and other like substances, 344 leases are now in force, comprising an area of 10,990.74 acres. The revenue collected from this source during the year amounted to \$12,928.81.

Bituminous Sands.—Owing to the great interest taken in the development of bituminous sands, otherwise known as tar-sands, situated on the Athabaska river, in the province of Alberta, it was decided to enact new regulations for the disposal of such rights. It is proposed in the new regulations that an applicant may obtain a permit covering a certain area of land, on which he shall erect a plant for the treatment of bituminous sands, and, when it has been demonstrated

that the plant is capable of separating the petroleum and petroleum products from the sands on a commercial basis, the permittee will be given an opportunity of acquiring a lease of a considerable area of land on payment of rental at fifty cents an acre.

The total revenue which has been derived by the Department from the disposal of tar-sand rights amounts to \$41,601.73. There are three leases now in force, comprising a total area of 3,643.20 acres.

Alkali.—Regulations have been made for the disposal of natural accumulations of soluble mineral salts, comprising, for the most part, sodium and magnesium sulphates found in a comparatively pure condition in certain of the sloughs and shallow lakes of southern Saskatchewan. Under these regulations, 43 leases have been granted, comprising a total area of 15,250.9 acres, and the revenue derived from this source during the fiscal year amounted to \$4,052.52. A number of these locations have been developed, plants for the purification and refining of the product have been erected at a very considerable cost, and large quantities of the refined salts have been disposed of to the different pulp and paper companies for use in the manufacture of certain grades of paper.

Gold Royalty.—The total amount which has been collected for royalty on gold obtained from placer deposits in Yukon Territory up to March 31, 1930, was \$4,968,155.96, of which amount \$16,438.46 was collected during the fiscal year. For the purpose of estimating royalty, the gold is valued at \$15 an ounce, which is below its real value. The total value of the gold which has been produced from placer mining operations in that territory might conservatively be placed at \$167,991,136.

Dredging.—Three leases to dredge for minerals in the beds of rivers in Yukon Territory are now in force, comprising a total river stretch of 14.43 miles. The total revenue derived from this source up to March 31, 1930, amounted to \$202,406.39. These leases comprise portions of the bed of the Klondike river.

For the purpose of gold recovery there are six dredges engaged in mining in Yukon Territory, all of which are being operated by hydro-electric motive power.

Forty leases to dredge for minerals in the beds of rivers in Manitoba, Saskatchewan, and Alberta are now in force, having a total frontage of 184½ miles. Of these leases, thirty-five are in Alberta, four in Saskatchewan, and one in Manitoba. The total revenue derived from this source amounted to \$66,209.01, of which sum \$527.20 was collected during the fiscal year.

Hydraulic Mining.—The regulations for the disposal of hydraulic mining locations in Yukon Territory were withdrawn by Order in Council dated February 4, 1904, but the leases then in force were not affected by such withdrawal. There are still five hydraulic mining locations held under lease, comprising a total area of fifteen square miles. Rentals, amounting to \$179,007.34, have been collected on account of such locations, the amount collected during the fiscal year being \$2,817.34.

Water Rights.—There are now in force in Yukon Territory 504 grants to divert water for mining purposes, under the provisions of the Yukon Placer Mining Act, which grants aggregate a total of 13,332 miner's inches.

The report for the fiscal year from the Gold Commissioner of the Yukon Territory dealing with mining in that territory is attached.

REPORT OF THE GOLD COMMISSIONER, DAWSON, YUKON TERRITORY, REGARDING
MINING

PLACER GOLD MINING

The amount of placer gold, mined during the year on which royalty export tax was paid, was 44,197·92 ounces, an increase over the previous year of 559·09 ounces.

Yukon Consolidated Gold Corporation, Limited.—This company operated dredge *Canadian No. 2* on Hydraulic Mining Lease No. 18. The dredge commenced digging on May 24, and closed down on October 1, having dredged 1,300,000 cubic yards. All of this was artificially thawed by water pumped from the Klondike river and distributed through the system by pipe lines. Three drills bored the pits in which the pipes were inserted in order to force the water to bedrock. Water was delivered under a pressure of forty-five pounds at the points.

Dredge *Canadian No. 3.*—This dredge, which had been idle since 1918, was reconditioned and commenced digging on September 25. It closed down on December 1, having dredged a total of 450,000 cubic yards. It also operated on Lease No. 18.

Dredge *Canadian No. 4.*—This dredge commenced digging on June 6, on Lease No. 18, and closed down on November 1, having dredged 1,100,000 cubic yards during the season.

Dredge *New North West No. 1* commenced operations on Upper Dominion creek on June 22, and closed down on November 1. A total of 600,000 cubic yards was dredged. All of the ground was artificially thawed, a thawing plant of 1,600 points being operated. The water for thawing was pumped from Dominion creek by two electrically driven pumps and delivered at the points under a pressure of thirty pounds.

Dredge *New North West No. 2* also operated on Dominion creek just below the town of Granville. It commenced operations on May 28, and closed down on November 21, having dredged 460,000 cubic yards. A thawing plant of 1,000 points thawed ground ahead of the dredge. The water flowed by gravity through ditches constructed under Water Grants Nos. 9024 and 9025.

Hydro-electric Power Plant.—This plant, which is operated by water taken from the north fork of the Klondike river under Water Grant No. 10, operated continuously throughout the year. Power was furnished for all the dredges which operated throughout the season. Two electrically driven shovels were operated digging an extension of the power canal 15·6 miles in length, which, when completed, will carry 20,000 inches of water from the south fork of the Klondike and discharge it into the north fork above the intake of the present ditch.

Power was also furnished to the Dawson Electric Light and Power Company for lighting the city of Dawson, and to the Dawson City Water and Power Company, for pumping and heating the water circulated through the city mains. A total of 11,565,000 K.W.H. was generated and transmitted to the various operations during the year.

Transmission Lines.—One hundred and thirty miles of high-tension power lines, which connect the power plant with the various sub-stations, were maintained in an efficient state of repair.

Hydraulics.—Two nozzles were operated at Crofton gulch and two on Lovett gulch. Water for these operations was supplied through the Twelve-mile ditch. A total of 530,000 cubic yards of gravel and bedrock was sluiced

during the season. Repairs to the ditch commenced on May 1, and were suspended on November 1. Hydraulicking commenced on May 15, and closed on September 30.

Transportation.—Four caterpillar tractors, four trucks and nine cars were in constant use during the season. Two new trucks were purchased in 1929. On an average two hundred and twenty-five men were employed during the season.

Other Placer Operations.—Many individuals and miners working in partnership were engaged in placer mining, and experienced a successful season. The prospecting leases on Thistle creek have been renewed. Considerable work was done on them last summer with a drag-line scraper, and it is the intention to prosecute the work vigorously this summer. Prospecting leases have also been issued as follows: Five miles on Selwyn river; one mile on Nansen creek; one mile on Johnson creek (a tributary of the McQuesten river); one mile on Upper Bonanza; one mile on Victoria gulch (a tributary of Upper Bonanza); two miles on Gauvin gulch, and one mile on O'Neil gulch, which are also tributaries of Upper Bonanza, and one mile on All Gold creek.

The dredge which was lying idle in the Glacier district for many years was taken over by a new company, and they commenced operations last summer on Sixtymile creek. They employed from twelve to fifteen men during the season and dredged about 100,000 cubic yards.

LODE MINING

Dawson District.—Development work has been continued on the Lone Star group of claims on Victoria gulch. Last summer they drove a tunnel in unbroken ground 82 feet south of the old tunnel for a distance of 205 feet. The extension of the Carthey vein was crosscut 146 feet from the entrance. The vein at the point of intersection was about four and one-half feet wide. On an average six men were employed during the season. It is the intention of the company to prosecute operations during the summer of 1930.

Claims on the Fifteemile, on the Yukon river, on Little Twelvemile, on Eldorado creek, and on Gold Run are still being held, but no extensive work has been done. The conglomerate claims on Indian river are in the same position as last year, several claims being held with the hope of obtaining capital for development.

Mayo District.—The principal operator in this district is the Treadwell Yukon Company, Limited. At the end of the year this company had under option, purchase, or located in its own name, sixty-three claims, or a total area of 1,677 acres, divided into seven separate groups for mining and prospecting purposes. During the year the company acquired the Silver King group of nine claims with an area of 274 acres. This property is located on Galena hill.

During the summer months the company shipped 6,909.49 tons of ore and concentrates containing 3,102,093 ounces of silver and 7,810,493 pounds of lead, which had a metal value of \$1,586,756.06 for the silver, \$528,360.10 for the lead, and \$3,397.66 for the gold ore, a total value of \$2,118,513.82. In addition, the company was instrumental in shipping for individual operators a total of 690 dry tons containing 185,503.92 ounces of silver and 952,092 pounds of lead, the smelter value of which was \$95,295.13 for the silver and \$62,888.03 for the lead, a total of \$158,183.16. The total production of the camp was 7,599 tons valued at \$2,276,696.98.

New Construction.—At the main camp of the Treadwell Yukon Company, Limited, a new 180-h.p. engine was installed to drive the compressor. At the Mastiff group a 1,500-foot transmission line was built to supply electrical energy for that operation.

At the Elsa group, a new bunk house and a mess house with a capacity for taking care of thirty men, were erected, as well as a blacksmith shop, compressor and change room. A 110-h.p. engine was installed to drive a new 500-cubic foot air compressor.

At the Silver King group, a new bunk house, two head frames, two ore bins, a large compressor, a hoist house and a blacksmith shop were built. This mine is equipped with a 165-h.p. engine, driving a 600-cubic foot compressor and a 75-kw. generator.

Sixteen miles of road were also constructed from the Mayo-Keno road junction at Williams creek, to facilitate handling supplies to the Mastiff, Elsa, and Silver King groups.

In the town of Mayo the company installed a 110-h.p. engine to drive a 60-kw. generator for lighting the town and furnishing power.

Outside of the operations of this company, considerable prospecting and development work has been done by individuals with promising results.

In the Beaver River district prospecting was carried on by the Consolidated Mining and Smelting Company on properties which they had under option. They employed eight men during the months of July and August, carrying out preliminary prospecting with a diamond drill. Several holes were drilled, some to a depth of 700 feet, but they have since released their options and have moved the machinery about thirty-five miles farther north on Silver hill, to the Carpenter and McLean group of claims, where drilling operations will be carried on during the coming summer.

The outlook for the future of this camp is promising, notwithstanding the drop in the price of silver. There will be more activity by individual prospectors and claim owners on the different hills.

Timber and Grazing

Despite the financial stringency which prevailed during the latter part of the fiscal year, the activities in timber, grazing, and hay continued at a high level. The total amount derived from these sources for the year was \$1,131,748.42. Although this amount represents a decrease of \$254,643.49 as compared with the previous year, yet it was considerably higher than any year prior to 1926.

During the spring and summer conditions in the lumber industry were very active, but unfortunately, owing to a great decline in building operations later, more especially in the rural sections, the demand for lumber was considerably curtailed. Because of these conditions, while the quantity of lumber manufactured shows an increase of over sixty million feet board measure as compared with the previous year, a large portion of this remained unmarketed.

Owing to the business depression in the autumn of 1929, there were fewer licence berths sold at public auction and fewer permit berths applied for. The main falling off in revenue occurred here, the decrease as compared with the previous year amounting to a little over \$210,000.00.

In the year 1925 grazing regulations were established allowing for the granting of twenty-one-year leases in the provinces of Saskatchewan and Alberta, and in the Railway Belt of British Columbia, and as this provided for more permanency of tenure, a decided impetus was given to stock raising. In spite of a lack of moisture in certain districts, a marked advance was made by holders of leases on Dominion lands. During the year 1,307 new grazing leases were issued making a total of 11,479 now in existence, covering an area of 7,221,334 acres, representing an increase of 21,443 acres over the previous fiscal year, and 494,319 acres over the year 1927-28. Stock returns show an increase over 1928-29 of 22,996 head of cattle, 23,190 horses, and 39,913 sheep, grazing on Dominion Government leaseholds.

There was a satisfactory increase in the number of hay permits taken out during the year. A total of 2,359 permits was issued to cut 26,095 tons, an increase of 359 permits, and 7,282 tons over the previous year. The total revenue from this source amounted to \$10,786.15 being an advance of \$3,799.58 as compared with 1928-29.

REVENUE

Comparative Statement of Revenue

Year	Revenue		Year	Revenue	
	\$	cts.		\$	cts.
1919.....	516,938	53	1925.....	958,136	62
1920.....	687,401	83	1926.....	1,109,013	05
1921.....	807,119	23	1927.....	1,193,905	20
1922.....	723,322	81	1928.....	1,389,978	57
1923.....	886,064	37	1929.....	1,386,391	91
1924.....	883,726	90	1930.....	1,131,748	42

DETAILS FOR FISCAL YEAR 1929-30

<i>Timber—</i>			
Bonus under licence.....		\$	61,630 83
Rent under licence.....			65,062 17
Royalty under licence.....			457,530 12
Permit fees, dues and rentals.....			361,563 62
Seizure dues.....			11,905 04
Licence fees.....			1,106 00
Scaling fees.....			13,694 09
Scale books.....			23 25
Total for timber.....		\$	972,515 12
<i>Grazing, Hay, etc.—</i>			
Grazing.....		\$	142,746 73
Hay.....			10,786 15
Registration fees.....			1,911 80
Improvements.....			3,788 62
Total for grazing, hay, etc.....			159,233 30
Total revenue.....		\$	1,131,748 42

REVENUE RETURNS BY AGENCIES*

Agency	Revenue from timber		Revenue from grazing, hay, etc.		Total	
	\$	cts.	\$	cts.	\$	cts.
<i>Manitoba—</i>						
Dauphin.....	11,576	35	3,437	54	15,013	89
Winnipeg, (Dominion Lands Agency).....		997 08		997 08		997 08
Winnipeg, (Crown Timber Agency).....	136,312	22	2,097	52	138,409	74
<i>Saskatchewan—</i>						
Moose Jaw.....	43	50	64,485	46	64,528	96
Prince Albert.....	120,078	47	11,462	72	131,541	19
<i>Alberta—</i>						
Calgary.....	48,805	31	15,519	82	64,325	13
Edmonton.....	253,510	68	4,181	65	257,692	33
Grande Prairie.....	4,922	29	1,220	64	6,142	93
Lethbridge.....	206	76	43,046	25	43,253	01
Peace River.....	3,828	67	3,598	51	7,427	18
<i>British Columbia—</i>						
Kamloops.....	71,641	46	8,952	66	80,594	12
New Westminster.....	294,743	13	71	91	294,815	04
Revelstoke.....	26,846	28	161	54	27,007	82
Totals.....	972,515	12	159,233	30	1,131,748	42

*In compiling the returns by agencies, moneys which were paid direct to Head Office, Ottawa, have been allocated to the agencies concerned.

TIMBER

The areas of timber berths under licence and under permit were as follows:—

Province	Square miles under licence	Square miles under permit
Manitoba.....	925 15	1,117 44
Saskatchewan.....	781 46	138 71
Alberta.....	1,167 14	349 25
British Columbia.....	1,587 49	82 74
	4,461 24	1,688 14

During the year there were 299 new berths granted, as follows, 24 licence, 34 permit, 86 fire-killed, 118 cordwood, 26 portable sawmill and 11 fringe.

The total number of berths held under licence and permit were 1,375, this being a decrease of 37 berths as compared with the previous fiscal year.

The following statements show the number of berths upon which operations were conducted, also the quantities of material manufactured and marketed, during the year under review.

Agency	Number of berths upon which operations have been conducted	
	Under licence	Under permit
Calgary.....	20	53
Edmonton.....	58	253
Prince Albert.....	43	104
Winnipeg.....	29	69
Kamloops.....	28	64
New Westminster.....	68	15
Revelstoke.....	13	46
	259	604

MATERIAL MANUFACTURED AND MARKETED UNDER LICENCE AND PERMIT BERTHS

Material	Under licence		Under permit	
	Manufactured	Marketed	Manufactured	Marketed
Timber..... ft. B.M.	405,517,195	362,130,593	64,824,754	52,222,262
Railway ties..... number	451,469	470,305	1,070,352	1,284,406
Laths..... pieces	23,611,587	16,831,412	1,778,995	1,615,995
Shingles..... pieces			1,308,000	223,750
Shingle bolts..... cords	34,463	21,216	3,701	3,525
Piling, cribbing, etc..... lin. ft.	189,180	479,240	86,114	82,647
Telephone poles, etc..... lin. ft.	4,069,727	4,071,782	1,189,084	1,178,464
Mining timber..... lin. ft.	1,067,352	1,179,023	649,875	672,299
Mine ties..... number			121	121
Fence posts..... number	154,587	159,627	399,786	399,423
Cordwood..... cords	5,815	6,915	15,341	16,238
Slabs, edgings, etc..... cords	22,540	23,503		
Fulpwood..... cords	7,626	4,485	13,724	14,654
Railway shims..... pieces	1,590,594	1,590,594		
Poxwood..... cords	615	1,233		
Lath bolts..... cords			89	121

NOTE.—When the material sold is in excess of the quantity shown as manufactured, such excess has to be considered as being part of the material manufactured in the previous fiscal year, but not marketed during that year.

GRAZING

The total area held under lease as of March 31, 1930, was 7,221,334 acres, comprising 11,479 leases as follows:—

Province	Number of leases	Area under lease
		acres
Manitoba.....	244	95,885
Saskatchewan.....	6,952	3,463,408
Alberta.....	3,917	3,208,289
British Columbia.....	366	453,752
	11,479	7,221,334

Ordinance, Admiralty and Public Lands

There was a substantial increase in the work of this division, owing to the number of applications received to purchase fractional and accrued areas.

When this work was taken over there were over 1,400 accounts and each purchaser of Dominion lands was furnished with a copy of his account from the sales register. Where the terms of sales were seriously in arrears the purchaser was given a reasonable opportunity to place the account in good standing. Many settlers remitted substantial payments and in a few cases the full amount of the indebtedness was remitted so that patent could issue. Due to this action the revenue for the year shows a substantial increase and there was derived from the sale of fractional areas and accrued lands the sum of \$98,012.90, an increase of \$45,540.16 over the fiscal year 1928-29. The revenue from Ordinance lands was \$30,276.65 in comparison with \$24,830.09 for the previous year.

New applications to purchase received during the year numbered nearly five hundred and sales were made in 320 cases for a total of 12,882 acres made up by provinces as follows:—

Province	Number of sales	Acres
Manitoba.....	25	1,147
Saskatchewan.....	122	4,933
Alberta.....	135	5,118
British Columbia.....	38	1,684

Letters patent to the number of 295 were issued to the purchasers of fractional and accrued lands for an area of 19,639 acres.

In the early settlement of the prairies grants of land were authorized by Parliament to aid in the construction of colonization railways. For years it was the understanding of the Department that the grants were of the surface only and did not include the minerals underlying these lands. However, the question became the subject of litigation and when brought before the Imperial Privy Council it was held that the title to the minerals should pass to the railway companies. During the year letters patent to the number of 101 were issued to the Calgary and Edmonton Railway for minerals underlying lands

where the surface had been patented to nominees of the company. There were issued to the Canadian Pacific Railway 179 patents for an area of 3,856 acres, being mostly lands taken for right of way and other railway requirements. Other railways were granted patents to the number of 177 for an area of 17,830 acres, a portion being for land subsidy, and other work was done preliminary to the issuance of letters patent for many additional lands.

Investigations have been made in several registry offices relative to the title to Ordnance lands. This information was got as a preliminary to the making of surveys when an endeavour will be made to place the lands on a revenue-producing basis.

REPORT OF THE FINANCIAL CONTROLLER

SUMMARY of net revenue collected from various sources during the fiscal year 1929-30.

Statement A — Dominion Lands.....	\$ 4,139,131 16
“ B — School Lands.....	2,260,765 78
“ C — Ordnance Lands.....	30,276 65
“ D — Registrar's Fees.....	575 50
“ E — Casual Revenue.....	14,105 29
“ F — Fines and Forfeitures.....	3,744 44
“ G — Seed Grain and Relief Repayments.....	337,868 63
	<u>\$ 6,786,467 45</u>

STATEMENT A — Dominion Lands Revenue for the fiscal year 1929-30

Agency	Agency payments		Head Office payments		Total revenue	
	\$	cts.	\$	cts.	\$	cts.
<i>Dominion Lands—</i>						
Calgary.....	26,951	11	2,353	79	29,304	90
Dauphin.....	6,443	17	405	19	6,848	36
Edmonton.....	67,934	36	5,953	58	73,887	94
Grande Prairie.....	28,615	12	354	79	28,969	91
Kamloops.....	2,955	86	1	00	2,756	86
Lethbridge.....	48,941	66	1,190	87	50,132	53
Moose Jaw.....	293,621	88	30,092	38	323,714	26
New Westminster.....	9,206	83	533	14	9,739	97
Peace River.....	38,373	75	533	49	38,907	24
Prince Albert.....	80,616	53	14,478	10	95,094	63
Revelstoke.....	941	81	71	00	1,012	81
Winnipeg.....	7,724	84	509	14	8,233	98
Miscellaneous.....	7,492	13	24,566	13	32,058	26
	619,819	05	81,042	60	700,861	65
<i>Crown Timber—</i>						
Calgary.....	62,646	49	1,678	64	64,325	13
Dauphin.....	14,898	04	115	85	15,013	89
Edmonton.....	251,297	94	6,394	39	257,692	33
Grande Prairie.....	6,084	93	58	00	6,142	93
Kamloops.....	80,397	86	196	26	80,594	12
Lethbridge.....	40,034	47	3,218	54	43,253	01
Moose Jaw.....	58,639	30	5,889	66	64,528	96
New Westminster.....	294,809	59	5	45	294,815	04
Peace River.....	6,837	01	590	17	7,427	18
Prince Albert.....	128,060	32	3,480	87	131,541	19
Revelstoke.....	26,924	02	83	80	27,007	82
Winnipeg.....	137,360	77	2,046	05	139,406	82
	1,107,990	74	23,757	68	1,131,748	42

STATEMENT A—Dominion Lands Revenue for the fiscal year 1929-30—*Conc.*

Agency	Agency payments	Head Office payments	Total revenue
	\$ cts.	\$ cts.	\$ cts.
<i>Forestry—</i>			
Alberta Inspectorate.....	59,889 63	1,012 98	60,902 61
British Columbia Inspectorate.....	25,252 42	13,338 10	38,590 52
Manitoba Inspectorate.....	26,859 37	200 00	27,059 37
Saskatchewan Inspectorate.....	62,511 70	2,095 00	64,606 70
Indian Head Nursery Station.....	5,014 95		5,014 95
Forest Products Laboratory Vancouver.....		513 50	513 50
Petawawa Military Reserve.....		5,721 38	5,721 38
Miscellaneous.....		75 15	75 15
	179,528 07	22,956 11	202,484 18
<i>Water Power and Reclamation—</i>			
Calgary, Irrigation Office.....	1,143 45		1,143 45
Calgary.....	54 49	301 00	355 49
Cold Lake.....		100 00	100 00
Dauphin.....		1,050 00	1,050 00
Edmonton.....	616 03	720 10	1,336 13
Lethbridge.....	50 15	968 29	1,018 44
Moose Jaw.....	956 59	0 58	957 17
Prince Albert.....	56 70	205 50	262 20
New Westminster.....		1,243 48	1,243 48
Winnipeg.....	194 22	109,039 76	109,233 98
	3,071 63	113,628 71	116,700 34
<i>Mining—</i>			
Calgary.....	636,807 00	85,092 91	721,899 91
Cold Lake.....	24,493 47	50 00	24,543 47
Dauphin.....	7,736 71	240 65	7,977 36
Edmonton.....	254,437 30	63,932 85	318,370 15
Grande Prairie.....	270 90	123 00	393 90
Kamloops.....	3,080 13	57 82	3,137 95
Lethbridge.....	324,530 85	55,311 18	379,842 03
Moose Jaw.....	17,327 55	3,100 08	20,427 63
New Westminster.....	8,276 11	207 78	8,483 89
The Pas.....	62,150 92	172 36	62,323 28
Peace River.....	5,088 45	313 23	5,401 68
Prince Albert.....	26,341 88	5,781 08	32,122 96
Revelstoke.....	57 50	18 00	75 50
Winnipeg.....	48,927 51	1,044 82	49,972 33
Unorganized.....	215 00	3,400 70	3,615 70
	1,419,751 28	218,846 46	1,638,597 74
<i>National Parks of Canada</i>			
Antelope.....		384 00	384 00
Banff.....	146,829 53	1,781 85	148,611 38
Brereton Lakes.....		10 00	10 00
Buffalo.....	1,101 42	25,278 97	26,380 39
Elk Island.....	166 50	9,227 00	9,393 50
Fort Anne.....		1 00	1 00
Glacier.....	100 23	97 00	197 23
Jasper.....	34,609 72	513 00	35,122 72
Lake Florence.....		66 00	66 00
Kootenay.....	14,374 51	57 00	14,431 51
Point Pelee.....		266 75	266 75
Prince Albert.....	584 73	10 00	594 73
Vidal's Point.....		171 00	171 00
Waterton Lakes.....	6,155 11	287 71	6,442 82
Yoho.....	3,130 35	481 65	3,612 00
Historic sites.....		30 00	30 00
Miscellaneous.....		215 15	215 15
	207,052 10	38,878 08	245,930 18
<i>Northwest Territories—</i>			
Fort Smith.....	16,002 79	114,756 80	130,759 59
<i>Yukon Territory—</i>			
Dawson.....	77,563 90	2 00	77,565 90
White Horse.....	5,218 81		5,218 81
	82,782 71	2 00	82,784 71
Total revenue cash.....	3,635,998 37	613,868 44	4,249,866 81
Less refunds.....			110,762 32
Net revenue cash.....			4,139,104 49
Net revenue scrip.....			26 67
Total net revenue.....			4,139,131 16

DEPARTMENT OF THE INTERIOR

STATEMENT B—School Lands Revenue for the fiscal year 1929-30

Province	Gross revenue	Refunds	Net revenue
	\$ cts.	\$ cts.	\$ cts.
Manitoba.....	36,850 92	1,529 61	35,321 31
Saskatchewan.....	1,434,177 52	20,947 36	1,413,230 16
Alberta.....	820,163 27	7,948 96	812,214 31
	2,291,191 71	30,425 93	2,260,765 78

STATEMENT C—Ordnance Lands Revenue for the fiscal year 1929-30

Fiscal year	Gross revenue	Refunds	Net revenue
	\$ cts.	\$ cts.	\$ cts.
1929-1930.....	30,308 90	32 25	30,276 65

STATEMENT D—Registrar's Fees for the fiscal year 1929-30

Registration district	Gross revenue	Land assurance	Net revenue
	\$ cts.	\$ cts.	\$ cts.
Yukon Territory.....	582 09	33 09	549 00
Northwest Territories.....	26 50		26 50
	608 59	33 09	575 50

STATEMENT E—Casual Revenue for the fiscal year 1929-30

Fiscal year	Gross revenue	Refunds	Net revenue
	\$ cts.	\$ cts.	\$ cts.
1929-1930.....	14,125 54	20 25	14,105 29

STATEMENT F—Fines and Forfeitures for the fiscal year 1929-30

Authority for penalty	Gross revenue	Refunds	Net revenue
	\$ cts.	\$ cts.	\$ cts.
Dominion Parks Regulations.....	2,615 34	275 00	2,340 34
Forestry Regulations.....	37 00		37 00
Migratory Birds Convention Act.....	620 25		620 25
Northwest Game Act.....	75 00		75 00
Northwest Territories Act.....	135 00		135 00
Indian Act.....	50 00		50 00
Criminal Code of Canada.....	10 00		10 00
Magistrates fees.....	476 85		476 85
	4,019 44	275 00	3,744 44

STATEMENT G—Seed Grain and Relief Repayments for the fiscal year 1929-30

Year	Gross collections		Refunds		Net revenue	
	Principal	Interest	Principal	Interest	Principal	Interest
	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.
1876.....	25 00	105 38			25 00	105 38
1890-91.....	22 40	38 50			22 40	38 50
1895.....	66 21	103 36			66 21	103 36
1896.....	115 66	158 40		2 54	115 66	155 86
1900.....	2 25	3 24			2 25	3 24
1901.....		0 33	4 50	5 25	Minus 4 50	Minus 4 92
1905.....	4 90	11 28			4 90	11 28
1908.....	383 57	408 95			383 57	408 95
1909.....	97 44	51 41	9 02	8 98	88 42	42 43
1911.....	796 71	648 27			796 71	648 27
1912.....	1,634 78	1,544 73		19 46	1,634 78	1,525 27
1913.....	96 37	112 65			96 37	112 65
1914.....	866 13	639 51			866 13	639 51
1915.....	109,774 59	91,508 89	2,234 09	2,554 42	107,540 50	88,954 47
1917.....	1,001 96	513 15	23 53	2 67	978 43	510 48
1918.....	10,090 10	6,899 21	20 91	602 56	10,069 19	6,296 65
1919.....	14,713 43	12,928 72	44 26	358 99	14,669 17	12,569 73
1920.....	13,846 11	10,680 17	202 27	454 34	13,643 84	10,225 83
1921.....	2,019 13	1,306 66	48 25	107 07	1,970 88	1,199 59
1922.....	1,995 33	1,361 97			1,995 33	1,361 97
1925.....	686 53	271 57		7 33	686 53	264 24
1926.....	187 25	39 68			187 25	39 68
Relief prior to 1915.....	95 34	149 03	4 35	4 65	90 99	144 38
Relief 1920-30.....	49,329 75	16,729 36	4,572 69	2,904 60	42,757 06	13,824 76
	205,850 94	146,214 42	7,163 87	7,032 86	198,687 07	139,181 56

STATEMENT H—Cash Receipts on Account of Dominion Lands Revenue for the fiscal year 1929-30

Source of revenue	Gross receipts	Refunds	Net revenue
	\$ cts.	\$ cts.	\$ cts.
Homestead fees.....	175,080 00	360 00	174,720 00
Improvements.....	61,289 88	45,213 54	16,076 34
Sales of land.....	428,123 90	4,797 38	423,326 52
Map sales, rentals, office fees, etc.....	97,537 90	2,147 08	95,390 82
Liquor permits, game licences, fur sales, etc.....	111,159 15	649 90	110,509 25
Timber dues.....	1,131,024 43	31,139 46	1,099,884 97
Grazing leases and hay permits.....	177,009 12	2,619 75	174,389 37
Irrigation and water power.....	69,997 50	443 56	69,553 94
Coal petroleum, mining, etc.....	1,708,488 15	20,155 94	1,688,332 21
National Parks of Canada.....	245,930 18	855 78	245,074 40
Miscellaneous.....	44,226 60	2,379 93	41,846 67
	4,249,866 81	110,762 32	4,139,104 49

STATEMENT I—Gross Dominion Lands Revenue Receipts compared with the previous year

Particulars	1929-30	1928-29	Increase
	\$ cts.	\$ cts.	\$ cts.
Dominion Lands.....	*700,888 32	1,033,327 84	†332,439 52
Crown Timber.....	1,131,748 42	1,386,391 91	†254,643 49
Forestry.....	202,484 18	223,265 50	†20,781 32
Water Power and Reclamation.....	116,700 34	94,774 33	21,926 01
Mining.....	1,638,597 74	1,053,581 68	585,016 06
National Parks.....	245,930 18	234,612 92	11,317 26
Northwest Territories.....	130,759 59	56,662 51	74,097 08
Yukon Territory.....	82,784 71	69,662 62	13,122 09
	4,249,893 48	4,152,279 31	97,614 17

*Including \$26.67 Scrip. †Decrease.

II

MINING SUPERVISION AND INSPECTION

REPORT OF THE SUPERVISORY MINING ENGINEER, C. C. ROSS

GENERAL

The past year has been one of steady progress in the investigation and development of mineral resources upon lands falling within the supervision of the Branch. The most striking activity is to be recorded in connection with the rapid extension of the Turner Valley oil and gas field, beginning in the latter part of last year, and leading to the location and drilling of new wells on a "boom" scale in the earlier part of the year under consideration. In the case of mining for metallic ores, serious efforts were made to investigate those deposits previously located in northern Manitoba and Saskatchewan, great progress being made in the heavy constructional programs already started at the major ore bodies of Flin Flon, and Cold Lake. The centre of gravity of the search for new districts may be said to have been transferred northwards, the eastern portion of the Northwest Territories being closely studied by organized expeditions based on aerial transport, the area of interest gradually extending westwards.

In addition to the office already established at The Pas in northern Manitoba, it was found necessary to open one at Winnipeg to enable the same services to be rendered to the mining community in central Manitoba as had shown such gratifying results in The Pas. The growing work of the Calgary office called for further additions to the staff and equipment, particularly in regard to subsurface work, and the study of methods of prevention of the waste of gas, a matter that has become increasingly important.

As in previous years, at the request of the Department of Indian Affairs, the engineers of the Calgary office have carried out inspections on the Stony, Sarcee, and Blood Indian reserves in regard to the petroleum and natural gas operations at those places.

OIL AND GAS

The year 1929-30 has shown a very gratifying increase in the production of both oil and gas, fully justifying the faith of the pioneers in the search for these minerals in Western Canada. As was to be anticipated from the trend of drilling activity in the previous year, the major share of this increase is due to the completion of development tests in Turner Valley. In fact, it may be affirmed that few, if any, deep oil areas have shown such a rapid rise in output from the inception of intensive drilling.

This increase of production, which had already begun to become noticeable towards the end of the previous year, gave the impetus to marked activity in the organization of new companies to undertake the drilling of wells in and adjacent to Turner Valley, where for a time a large number of wells were drilling. The financial depression occurring later, somewhat curtailed this activity but not before the productive area was considerably extended, notably towards the south end of the field. But little attention has been bestowed on the north end.

As a consequence of the footage drilled in and around Turner Valley, the Calgary office has been called upon to collect and examine a vast amount of sample material produced from the formations encountered. It is gratifying to

be able to record that the sampling has been carried out by operators in an exemplary manner, and the fullest co-operation with the office shown in its handling. The information thus gleaned as to the subsurface conditions of these areas, has therefore been of a high order of reliability, and it has been possible to recognize structural details which the smaller scale operations of previous years had not made possible. In accordance with the established custom, the well samples have been transferred to the Geological Survey for more detailed study, but the great bulk of these and the need of an immediate recognition of "markers" in the wells during drilling, both for the purposes of the Calgary office in the work in connection with the administration of the petroleum and natural gas regulations, and for the work of the Geological Survey, led to the establishment of closer co-operation between the two departments towards the close of the year.

The closer study of the subsurface geology has confirmed the more complex structure of Turner Valley that had been suspected to prevail since the drilling of wells began along the eastern margin of the valley. An event of great importance in this connection has been the proof obtained from the Sterling Pacific well on section 33, township 18, range 22, west of the 5th meridian, that younger formations underlie the productive limestone. This may be explained by the limestone having been thrust over the younger rocks from the westward and has, as a corollary, the occurrence at very much greater depth of the same productive horizons as have already been developed in Turner Valley. Whether the resulting structure in depth, which extends to the eastward from the proven Turner Valley field, can be reached by the drill remains to be demonstrated. Considerable drilling activity began to the west of Turner Valley, but production had not been obtained at the close of the year.

Operations at other points in Alberta were satisfactory, and productive oil has been proven at three points widely separated. The first of these, Meridian No. 1 (old Advance No. 3), located in township 45, range 1, west of the 4th meridian, on being drilled to 1,822 feet penetrated oil-bearing sand. The well was put on production during June and has been pumped intermittently since then. Continuous pumping, however, has not been possible, owing to lack of storage. The oil is 13 degrees Beaumé in gravity and carries only a small percentage of water. Two other wells are now in process of drilling on territory adjoining the discovery well.

Oil bearing formation was also penetrated at the Fuego Oil Company's No. 1 well south of Oyen and located in township 25, range 4, west of the 4th meridian. Spasmodic drilling has been in progress at this well for several years and the well was drilled without successful water shut-off being carried out. The present management, after considerable drilling difficulties, succeeded in partly shutting off the water, and carried the drilling down to 3,133 feet, where the first oil was encountered; the oil grades 10.2 degrees Beaumé. From a chemical analysis of the water it would appear that this is from a higher horizon and not in conjunction with the oil; it is therefore probable, that further wells drilled on a strict water-shut-off specification will develop a good production of commercial oil.

In the Skiff area Devenish Petroleums Limited drilled wells Nos. 2 and 3; the former of these met with negative results, as the location was found to be off structure. No 3, located close to No. 1, encountered the oil sands at 3,054 feet. The oil from this depth was of 19.5 degrees Beaumé gravity and under the departmental test gave a daily output of thirty-six barrels net of clean oil. The oil carries a small percentage of water but this, in all probability, is due to migration from No. 1 well where water is present. A test by the Dauntless Oils Limited considerably to the west of the Devenish wells, although proving the presence of a petroliferous formation, met with negative commercial results and has been abandoned.

The most important oil discovery during 1929 was that made in the Red Coulee area, five miles west of Coutts. The Vanalta No. 1 well, located in township 1, range 16, west of the 4th meridian, penetrated the productive sand at 2,467 feet, the gravity of the oil being 31.1 degrees Beaumé free from water. As this discovery has all the earmarks of a commercial pool, public interest was at once aroused on both sides of the international boundary, and several wells were at once started. Four of these have encountered commercial oil and are now in production, three being in the United States and one in Canada. At present four wells are being drilled on the Canadian side and many more are projected.

The remaining discovery was made at Kinsella, where the Duluth Syndicate, in their No. 1 well, located in township 48, range 10, west of the 4th meridian, discovered commercial gas at 2,080 feet; the initial volume exceeded twenty-seven million cubic feet per day under a pressure of 750 pounds per square inch. Further wells are projected in this area. The gas discovery in the Cypress hills south of Medicine Hat reported in last year's report was not conclusively tested as the initial well had to be abandoned. A second well is nearly ready to begin drilling.

The occasion is opportune to mention that all of the new discoveries made in 1929, excepting that at Skiff No. 3, were made solely with cable percussive tools, proving conclusively that when this drilling system is efficiently supervised and the drilling done by competent cable drillers, deep wells can be drilled and satisfactory results obtained.

At several points in Alberta deep well prospecting is in progress; of these the most important are being drilled at Spring Coulee, township 4, range 23, west of the 4th meridian, and at Duvernay, township 55, range 12, west of the 4th meridian. These two tests are being drilled with the rotary water flush system but with considerable coring of the formations encountered. Efforts to prove suitable underground structure on the prairies where oil and gas may have accumulated continue to be carried out, and although results are not conclusive the geological information gained to date is of great value.

Drilling in both Saskatchewan and Manitoba has been spasmodic and has not brought to light anything of importance. These attempts in most cases are handicapped by the isolation of the locality and the consequent difficulty in obtaining management and equipment. However, despite such drawbacks those in charge of operations deserve much credit for the work done, often under very unfavourable conditions.

PRODUCING WELLS

In order that a proper understanding of the category of producing wells be arrived at, it should be pointed out that a number of wells produced oil while drilling, others are reckoned as completed although they have not as yet produced oil or gas, and a number of wells have produced oil and gas for a number of years or are susceptible of producing. Many gas wells were closed in for the entire year or for most of the year. No census of gas wells susceptible of producing is therefore here attempted, but the collective status of oil producers is as follows:—

33 wells produced naphtha and gas in Turner Valley;

14 wells produced light crude in Turner Valley; of these, 4 also produced naphtha;

2 wells produced light crude in Red Coulee;

6 wells produced heavy crude in Wainwright;

1 well produced heavy crude in Skiff and another well is a potential producer;

1 well produced heavy crude in the Ribstone field.

This makes a total of fifty-three wells producing oil, four of which produce two grades. A number of companies continued the work of test drilling not directly intended to produce oil and gas, but rather to discover structure favourable to deep drilling. During the fiscal year in Alberta, 164 holes made an aggregate footage of 55,718 feet, while in Saskatchewan five holes made 3,583 feet.

PRODUCTION

Production in barrels for the fiscal year ended March 31, 1930, and for the previous year, together with per cent increase in production, is as follows:—

Year ended	Turner Valley		Red Coulee	Wainwright	Ribstone	Skiff	Total
	Naphtha 60° or over	Light crude 30° to 60°	Light crude 30° to 60°	Heavy crude 30° or under	Heavy crude 30° or under	Heavy crude 30° or under	
Mar. 31, 1930.....	1,038,460	70,760	7,294	14,229	2,839	1,432	1,135,014
Mar. 31, 1929.....	449,247	74,524	.....	7,953	.....	.....	531,724
Per cent increase.	131	-5	.....	79	.....	.....	91

Only in Wainwright was any water produced with oil, and in amounts relatively small in comparison with total oil produced.

STORAGE

Oil produced was consumed within short periods following production, the demand being such that in addition, considerable quantities of crude and refined products were imported. The amount of stored oil was at all times small in comparison with rate of production.

PRICE CHANGES

Naphtha is graded for refinery purposes on a colour basis, but for the purpose of these records, all oil produced from the lime in Turner Valley, and any of a gravity higher than 60 degrees coming from above the lime are grouped together. Clear naphtha ranged from \$3.44 to \$3.95 per barrel; discoloured naphtha from \$3.20 to \$3.50. Light crude prices varied to some extent with the gravity of the oil and point of production. Turner Valley light crude ranged from \$2.40 to \$3.10, while Red Coulee crude was worth \$1.90 at the refinery. Heavy crude prices are not available, as it was distilled practically at the well mouth and sold as distillate, etc. Its value may be estimated at \$1 per barrel.

OIL PIPE LINES

A four-inch line from Turner Valley to the Imperial Oil Refinery at Calgary, laid in December, 1925, handles both naphtha and light crude. During the year a four-inch line was laid from Turner Valley to the Regal Refinery at Calgary which handles both products. A composite pipe line two inches to four inches has been laid from Red Coulee field to the Maple Leaf Refinery at Coutts, but is not yet in use.

DEPARTMENT OF THE INTERIOR

NATURAL GAS USED IN ALBERTA IN 1929

(Quantities in thousands of cubic feet)

	Used	Domestic	Commer- cial	Industrial	Total
Turner Valley.....	16,267,158	5,829,744	1,140,453	9,714,360	16,684,557
Foremost.....	366,699				
Burdett.....	4,098				
Brooks.....	46,602				
Viking.....	2,628,133	1,702,875	579,211	346,047	2,628,133
Wainwright-Fabyan.....	755,947	55,947		700,000	755,947
Wetaskiwin.....	40,000			40,000	40,000
Redcliff.....	860,000	70,000		790,000	860,000
Medicine Hat.....	2,260,000	600,000	40,000	1,620,000	2,260,000
Totals.....	23,228,637	8,258,566	1,759,664	13,210,407	23,228,637

DRILLING ACTIVITY

Turner Valley and adjoining foothills between the Highwood and Ghost river areas are here grouped together, the remainder of Alberta being similarly treated as a unit. During the fiscal year, in the foothills area, 122 wells made 313,788 feet of hole, and of these wells, 88 were started during the year. At the close of the year 51 were drilling, 41 suspended, 10 abandoned, and 20 completed. Elsewhere in Alberta, 55 wells made 79,774 feet of hole. Of these, 42 were started during the year. At the end of the year 13 wells were still drilling, 21 suspended, 4 abandoned, and 18 completed, 10 being completed as gas wells.

In Saskatchewan, 6 wells made 8,044 feet; of these, 4 were started during the year. At the end of the year all were either suspended or abandoned. In Manitoba, 1 well was drilled to 1,012 feet. In British Columbia, 2 wells made 340 feet of hole. In addition, some work was done in the Flathead area, but as these wells did not report to this office, no accurate account of their operations can be given.

TURNER VALLEY AND VICINITY

(Locality is in Turner Valley unless otherwise stated)

Company	Well No.	Locality	1, Apr. 1929	31, Mar. 1920	Drilling	Suspended	Abandoned	Completed	Remarks
Advance.....	5		3,000	3,451			1		Abandoned, drilling difficulties.
"	5A		0	5,164	1				
Alberta Pacific Consolidated.....	T.V. 1		0	5,364	1				
"	T.V. 2		0	5,455	1				
Anaconda.....	1		0	2,610	1				
Anglo Pacific.....	1	Waite Valley.....	0	130		1			
Angus.....	1	"	0	2,050	1				
Associated.....	1		4,530	5,410				1	Completed, gas, naphtha producer.
"	2		0	3,806	1				
Atlantic Keystone.....	1	Ghost River.....	0	2,930		1			
Baltac.....	1		0	5,874				1	On test for production.
Banner.....	1	Highwood.....	0	596	1				
Baymar.....	1	Ghost River.....	0	850		1			Temporarily suspended.
Bow River.....	2	Jumping Pound.....	2,375	3,530			1		Gas obtained—unfavourable geological conditions.
British Dominion.....	2		3,800	5,177				1	Completed as gas and naphtha producer.
Brook.....	1	Waite Valley.....	0	3,710		1			
Calgary Development and Producers.....	1	Waite Valley.....	0	2,733	1				

TURNER VALLEY AND VICINITY—Continued

(Locality is in Turner Valley unless otherwise stated)

Company	Well No.	Locality	1 Apr. 1929	31 Mar. 1920	Drilling	Suspended	Abandoned	Completed	Remarks
Calmont	1		5,650	5,650	1				Efforts to sidetrack lost tools.
"	2		0	4,845	1				
"	3		0	1,582		1			Temporarily suspended—waiting rotary rig.
"	4		0	3,834		1			Suspended
"	5		0	4,082		1			Suspended
"	6		0	3,770		1			
"	7		0	3,995	1				
"	8		0	1,602		1			
"	9		4,930	4,930		1			Formerly Seneca—tried to deepen—suspended.
"	10		0	1,604		1			
"	11		0	461		1			
"	12		0						Derrick up.
Commonwealth	T. V. 1		0	4,421		1			Testing oil production.
Dalfin	1		0	3,319		1			Suspended.
Dalhousie	1		4,565	4,565					Intermittent producer gas, naphtha.
"	5		4,900	4,900				1	Steady producer, light crude.
"	6		5,593	5,593				1	Steady producer, gas and naphtha.
"	7		0	5,014		1			Waiting diamond drill.
Dome	1		0	5,720	1				Gas and oil showings.
East Crest	1		3,725	4,412	1				Fishing.
"	2		0	3,208			1		Abandoned, drilling difficulties.
"	2A		0	1,468	1				Drilling.
Elbow	1	Bragg Creek	0	3,041		1			Temporarily suspended.
Foothills	1		5,914	5,914				1	Steady producer gas, naphtha.
"	2		3,787	4,710					
"	3		0	6,054	1				
"	4		0	4,559			1		Abandoned, unfavourable geological conditions and drilling difficulties.
Freehold	1		2,535	4,825		1			Suspended.
"	2		0	4,226	1				
"	3		0	55		1			
Frontier	1		875	2,240			1		Abandoned—unfavourable geological conditions.
Gibraltar	1	Waite Valley	0	1,430		1			
Hargal	T. V. 1		0	5,150	1				
Herron	1	Bragg Creek	0	1,420	1				
Highwood	1	Highwood	4,152	4,525			1		Unfavourable geological conditions and no production.
Home	1		5,280	5,280				1	Large intermittent producer light crude gas, naphtha.
"	2		5,353	5,507				1	Large producer light crude gas, naphtha.
"	3		5,033	5,139				1	Large producer, gas, naphtha.
"	4		0	5,601				1	Large producer, gas, naphtha.
"	5		0	4,492	1				
"	6		0	2,693					
Homestead	1		0	4,440	1				
Hudson's Bay	1	Highwood	0	1,425	1				
Hyo	1		0	2,610		1			Suspended.
Illinois-Alberta	1		3,861	3,861				1	Steady producer gas, naphtha
"	2		3,622	3,650		1			Suspended.
Indian	1	Rickert	0	1,130		1			
Innerfold	1	Waite Valley	0	3,345					
Invaders	1		0	4,740	1				
Lowery	1		0	5,473				1	Completed, gas, naphtha producer.
Lundy-Freeman	1		0	5,163	1				Drilling, gas and oil shows.
Mayland	1		5,235	6,242		1			Shut down.
"	2		0	3,946	1				
"	3		0	4,466	1				
Melbourne	1	Stony I.R.	2,130	2,258		1			Suspended.
Mercury	1		200	4,575		1			Suspended — waiting rotary rig.
"	2		0	4,972	1				
"	3		0	5,123		1			Started as Sunlight No. 1. suspended.
"	5		0	2,140	1				
Merland	1		0	4,470		1			Some production, naphtha. to deepen.
Midfield	1		500	3,728	1				
Mid Royal	1		0	2,140		1			Suspended.
Mill City	1		0	400			1		Abandoned—drilling difficulties.
"	1A		0	4,957	1				Fishing.

TURNER VALLEY AND VICINITY—(Locality is in Turner Valley unless otherwise stated)—Continued

Company	Well No.	Locality	1, Apr. 1929	31, Mar. 1920	Drilling	Suspended	Abandoned	Completed	Remarks
Miracle.....	1		0	3,960		1			
Model.....	1		4,235	5,905				1	Completed as gas and naphtha producer.
Moose Oils.....	1	Moose Mtn.....	0	2,440	1				
McLeod.....	1		3,930	3,930				1	Producer, gas, naphtha.
".....	2		4,360	4,420				1	" " "
".....	3		4,881	4,973				1	" " "
".....	4		4,972	5,230				1	" " "
".....	5		0	3,240	1				
New McDougall-Segur.....	1		2,495					1	Abandoned, drilling difficulties.
" " ".....	2		5,150	5,352				1	Completed, gas, naphtha producer.
" " ".....	3		3,285	4,646	1				
" " ".....	4		0	4,150	1				
Northwest, Calgary and Edmonton.....	1		0	2,103	1				
Okalta.....	1		5,040	5,040				1	Intermittent producer gas naphtha.
".....	2		3,171	4,458	1				Producer light crude while drilling.
".....	3		2,550	4,038	1				Producer light crude while drilling.
".....	4		0	1,664		1			Suspended.
".....	5		0	1,623		1			Suspended.
Outwest Petroleum.....	1	New Black Diamond.....	0	3,702				1	Abandoned, unfavourable geological conditions.
Paramount Oils.....	1	Rickert.....	0	1,832	1				
Ranger Oils.....	1		0	893		1			
Regent Oil Co.....	1		3,870	3,908				1	Completed, gas, naphtha producer.
" ".....	2		0	1,978		1			Suspended,
" ".....	3		0	2,445		1			
Richfield.....	1	Waite Valley.....	0	4,150	1				
Rockland.....	2	Stony I. R.....	0	1,018		1			Suspended—(Gold Coin).
Roselite.....	1	New Black Diamond.....	0	835		1			Suspended.
Royalite.....	1		3,924	3,924				1	Small gas producer
".....	2		3,170	3,170				1	Inactive.
".....	3		2,830	2,830				1	Small gas producer.
".....	4		3,740	3,740				1	Producer gas, naphtha.
".....	6		4,531	4,531				1	Gas, naphtha, producer
".....	7		4,208	4,208				1	Gas, naphtha producer under repair.
".....	8		3,753	3,753				1	Gas, naphtha producer
".....	9		5,593	5,593				1	" " "
".....	10		2,332	2,332				1	Produced light crude, inactive.
".....	11		2,474	2,474				1	" " "
".....	12		3,840	5,444	1				
".....	13		4,946	4,946				1	Producer, gas, naphtha.
".....	14		3,656	3,757				1	" " "
".....	15		3,047	3,047				1	Producer, light crude.
".....	16		5,060	6,224				1	Testing for production.
".....	17		3,965	4,034				1	Producer, gas, naphtha.
".....	18		3,887	3,887				1	" " "
".....	19		4,110	4,651	1				
".....	20		3,174	3,210				1	Producer, light crude.
".....	21		3,350	5,034				1	Producer, light crude, gas, naphtha.
".....	22		2,250	2,250					Drilled for gas storage, inactive.
".....	23		1,500	5,331				1	To shoot well for production.
".....	24		0	2,074	1				
Signal Hill.....	2	Bragg Creek.....	2,700	3,907	1				Oil showings
Sinclair Morley.....	1	Stony I. R.....	0	1,594		1			Gas showings (Norcon)
Sioux City.....	1		0	4,404	1				Produced oil while drilling
Southern Lowery.....	1		0	2,945	1				
Spooner.....	1		5,230	5,230				1	Producer gas, naphtha
".....	2		5,160	5,983				1	" " "
".....	3		0	3,240				1	Abandoned—unfavourable geological conditions
Spray.....	1		0	2,220	1				
Sterling Pacific.....	1		0	6,525				1	Producing naphtha and gas.
Structure.....	1		0	3,405				1	Produced some oil while drilling.
Stockmen.....	1		5,300	5,300				1	Produced some gas
Turner Basin.....	3		0	3,735		1			Suspended—(Successor of Stockmen)
United Oils.....	4		5,377	5,377				1	Producer, light crude
Vanalta.....	T. V. 1		0	2,999		1			Suspended.
Vanberta.....	1	New Black Diamond.....	0	846		1			Suspended.
".....	2		0	115					
Vimy Oils.....	1		0	3,550		1			Suspended.
Vulcan.....	1		5,030	5,030				1	Producer gas, naphtha
Wabash.....	1	Stony I. R.....	20,71	3,056	1				Gas shows.
Warner.....	2	Highwood.....	0	1,310				1	Abandoned—drilling difficulties.
".....	3	".....	0	2,485	1				

TURNER VALLEY AND VICINITY—(Locality is in Turner Valley unless otherwise stated)—Concluded

Company	Well No.	Locality	1, Apr. 1929	31, Mar. 1930	Drilling	Suspended	Abandoned	Completed	Remarks
Wellington	1		0	4,755	1				
Western Alberta	1		0	3,200	1				
Weymarn	1	New Black Diamond	1,320	3,695	1				
Widney	1		0	3,252				1	Producer, light crude.

OTHER AREAS IN ALBERTA

Admiral Oils	1	Wainwright	0	2,698	1				
Alberta Clay Products	3		0	157	1				
Alberta Gas and Fuel	1	Champion	0	2,750			1		Abandoned, drilling difficulties and unfavourable geological conditions
Bituminous Sand Extraction Co.		McMurray	165	165		1			(2 wells) suspended
Beaumont	1	Wainwright	0	2,183				1	Completed—not yet pumped
"	2	"	0	668		1			Suspended, temporarily
Bethwain	1	"	0	2,485		1			Suspended
"	2	"	0	2,154		1			Suspended
British Petroleum	3B	"	2,250	2,250				1	Oil producer
British Wainwright		"	2,238	2,238				1	Completed—not pumped
Capitol Oil & Gas	1A	Milk River	0	3,310	1				
Cole	1	Taber	0	3,319	1				
Commonwealth	1	Milk River	1,390	3,694	1				
"	1	Red Coulee	0	720	1				
Dauntless	1	Skiff	0	3,295		1			Testing oil sand
Devenish	1	"	3,088	3,088				1	Potential oil producer
"	3	"	3,061	3,079				1	Produced some oil.
Eagle Butte	1	Cypress Hills	3,340	4,002				1	Abandoned.
"	2	"	0	30		1			
Edalta	1	Wainwright	0	2,098		1			Suspended
Edmonton Wainwright	1	"	2,250	2,250				1	Oil producer
Fabyan	1	"	1,778	1,878		1			Suspended—some oil
Fusgo	1	Oyen	2,215	3,165	1				Some oil and gas
Globe	1	Pigeon Lake	1,200	1,200				1	Some repairs—abandoned
High River Oilfields	1	High River	0	269		1			Suspended
Hudson's Bay Oil & Gas	2	Viking	0	2,150				1	Gas producer
"	1	Eyremore	0	990				1	Abandoned—drilling difficulties
"	1S	"	0	1,300	1				
Int. Bitumen		McMurray							
Kotop	1	Red Coulee	0	1,650		1			
London Ribstone	2	Dunn	0	1,630		1			Suspended
Madison	2	Milk River	730	1,810		1			Suspended
Maple Leaf	1	Wainwright	1,776	1,776				1	Gas producer
"	2	"	0	1,775				1	Gas producer
Medicine Hat	48	Medicine Hat	0	1,098				1	Gas producer (C.P.R. No. 4)
"	49	"	0	1,012				1	"
"	50	"	0	1,025				1	(Med. Hat Brick & Tile Co.)
Meridian	1	"	1,820	1,834				1	Oil producer
"	2	"	0	1,776		1			"
McDonald	1	Kinsella	0	2,081				1	(Duluth Syndicate)
Northwestern Utilities	16	Viking	0	2,140				1	Gas producer
"	17	"	0	2,215				1	Gas producer
"	18	"	0	2,118				1	"
"	19	"	0	250		1			Drilling
"	20	"	0	0					Ready to drill
Onalto	1	Wainwright	0	1,922		1			Suspended temporarily
Ontario-Alberta	1	Suffield	2,210	3,343	1				
Oxville	1	Oxville	0	1,925	1				
Peninsular	1	Wainwright	0	227	1				Drilling
Ranchmens	1	Aldersyde	3,009	3,960	1				
Range	2	Milk River	990	2,100		1			Suspended
Ribstone Oils	2	Ribstone	2,100	3,230		1			Suspended
Ribstone Imperial	2	"	0	833		1			
Sasko-Wainwright	1	Wainwright	2,247	2,247				1	Oil producer
Sentinel	1	Black Diamond	4,615	5,811		1			Suspended
Twin Dome	1	De Winton	0	1,255		1			Suspended
Vanalta	1	Red Coulee	0	2,477				1	Oil producer, light crude
"	2	"	0	2,478				1	"
Wainwell	1	Wainwright	2,072	2,225				1	Oil producer, hole cemented back to 2,068 feet.
"	2A	"	2,034	2,034				1	Gas producer
"	4	"	0	2,054				1	Oil producer
Wainwright Pet.	1	"	0	2,252				1	Completed—not produced
Western Consolidated	1	"	1,360					1	Abandoned by Onalto
Weymarn	1	Fincher Creek	975			1			Attempted to deepen—suspended—formerly Mount Royal
"	2	"	0	1,430	1				Drilling

NOTE:—This list includes oil wells that produced oil during the fiscal year, but does not include gas wells previously drilled and still producing gas, or potential producers of natural gas.

SASKATCHEWAN

Company	Well No.	Locality	1, Apr. 1929	31, Mar. 1930	Remarks
Citizens Oil & Gas.....	3	Vera.....	0	1,850	Suspended—(formerly Unity Valley)
Eden Valley.....	1	.....	0	585	Suspended
Gessell Delta.....	.....	.....	227	.....	.....
Pike Lake.....	1	Pike Lake.....	0	3,155	Abandoned
Simpson.....	1	Simpson.....	2,170	2,180	Suspended
Vermillion Hills.....	1	Vermillion Hills....	0	264	Suspended

MANITOBA

Dauphin.....	1	Dauphin.....	0	1,012	
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BRITISH COLUMBIA

Sumas.....	1	524	711	Abandoned—drilling difficulties
".....	2	0	153	Suspended

NOTE:—There was also some work done in the Flathead district but accurate figures are not available, as the companies did not report to this office.

CONSERVATION OF GAS

As pointed out in the annual report for the fiscal year ended March 31, 1929, the surplus of gas in Turner Valley had assumed large proportions, necessitating burning for safe disposal. The burning of waste gas has taken place since the bringing in of the well known as Royalite No. 4 in 1924, but until towards the close of the fiscal year mentioned, it assumed large proportions only during the season of small demand in the summer.

So soon as the waste became not only great, but continuous, joint action was decided upon by the Dominion and Alberta governments, and a committee was appointed in May, 1929, to investigate and report upon the situation. The investigation was to explore the possibilities of the following:—

- (1) Conservation of the gas by storage underground.
- (2) Restriction of production.
- (3) Utilization of the gas (a) as a fuel, or (b) as a source of other materials such as carbon black, chemical products, etc.

The Department of the Interior was represented on the committee, which was under the chairmanship of Dr. C. Camsell, Deputy Minister of Mines, by Mr. C. C. Ross, Supervisory Mining Engineer.

The study of these problems, which has been carried on by officers of the department in the field since waste became apparent, was continued and extended, and in addition the Supervisory Mining Engineer carried out an investigation in the more important fields of the United States, where analogous conditions prevail, to ascertain the latest practice there in regard to the first two points above enumerated. In the final report the committee stated that they considered that the only solution which would make conservation possible was recognition of the fact that Turner Valley was a gas field, and the formulation of rigid regulations for the purpose of controlling all phases of the gas producing industry. They found that all other measures could only be palliative.

COAL MINING

Alberta

In Alberta, coal is found in three horizons of the Cretaceous rocks and in small areas in the Tertiary. The principal localities where coal mining development has taken place are as follows:—

KOOTENAY SERIES

Crowsnest Pass District.—In this area, which includes Coleman, Blairmore, Bellevue, Frank, Hillcrest, and Passburg, the seams worked vary from six to eighteen feet and pitch up to 60 degrees. The coal lying above water-level has supplied the major portion of the output in former years, but as this easily mined coal has gradually worked out, dip workings have been developed. These lower workings require considerable pumping to keep them clear of water. The main supply of locomotive fuel for the Canadian Pacific Railway in the prairie divisions is drawn from this district. Coke ovens were formerly operated at Coleman, Lille, and Passburg, but owing to the lack of demand by the smelters of southern British Columbia, the making of coke was discontinued. Owing to the occurrence of two explosions in the Crowsnest district during the year 1926, rock dusting has been introduced as a means of preventing the spread of an explosion in the coal-dust-charged mine atmosphere. Dry-cleaning plants have been installed at the principal mines, whilst at Bellevue a wet-washer has been added to the cleaning equipment.

Canmore District.—At Canmore semi-bituminous coal is mined and is largely disposed of as railway locomotive fuel. A briquetting plant is in operation, and 26,180 tons of coal were used in making briquettes. These were sold for household fuel in the territory between Vancouver and Winnipeg. The coal measures at this point have been subjected to very complicated folding. Two seams varying from five to ten feet in thickness are being mined.

Brazeau District.—In the Nordegg area semi-bituminous coal is mined on a large scale from two seams, one seven feet and the other fourteen feet in thickness with a dip of about 12 degrees. The output is disposed of to the Canadian National Railways as locomotive fuel. A dry-cleaning plant is operated at this property.

Mountain Park District.—At Mountain Park, Cadomin, and Luscar, bituminous coal is mined on a large scale. The seams vary in thickness from five to fifty feet with dips of from 30 to 80 degrees. At Cadomin two shafts have been sunk to give access to the lower levels of the seams which have hitherto been worked above the river level. Prospecting has been carried out north of Luscar and new development is contemplated as soon as arrangements are completed for the extension of the Luscar spur, part of the Mountain Park branch of the Canadian National Railways. Since the abandonment by the Blue Diamond Coal Company of their operations at Brulé, the company have staked out large claims in the Hay River area about thirty-five miles northwest of Solomon. Surface prospecting of the coal measures in these areas has been carried out.

BELLY RIVER SERIES

Lethbridge-Taber District.—The principal operations in this formation are carried on in the vicinity of Lethbridge, where several companies have large and well-equipped plants. The seams are reached either by shafts or slopes, varying in depth from 300 to 600 feet. The seam worked is about 4 feet 4 inches thick and is horizontal. The continuity of the seam generally is interrupted

by a series of small faults varying from two to ten feet. The development started by the Cadillac Coal Company, Limited, on the Kipp-Retlaw extension of the Canadian Pacific Railway has been continued, and the property brought into the production stage and operated throughout the year. The mine is located on the northern portion of the Lethbridge field. At Taber a lower seam in this formation has been worked for several years but only small-scale operations are now being conducted. The Leland Coal Company suspended operations at the Canada West mine and the equipment is being dismantled. Seams in the Foremost beds of the above series are worked as small, country-bank-mines at several points in the southern portion of the province and supply fuel for local use.

Brazeau District.—On the Brazeau branch of the Canadian National Railways the mines operated by the Bighorn and Saunders Creek and Alexo Coal companies have continued in operation throughout the year. New equipment and coal-cutting machinery have been installed.

Coalspur District.—In the Coalspur area, the open pit mines at Sterco and Coal Valley have continued in operation. The Lakeside Coal Company—formerly the Balkan Coal Company—at Minehead have installed a new screening plant and equipment. At Hinton, on the main line of the Canadian National Railways, the operations by the Alberta Mountain Collieries, Limited, have been suspended. The Jasper Coal Company, Limited, have installed spur tracks and modern tipples and have extended their underground development, and are now on a shipping basis. Further prospecting has been carried out by means of core drills by various lessees in this district.

Grande Prairie District.—In the Grande Prairie district the coal seams worked are three feet thick, the output being disposed of for local use. Only small scale operations are being conducted.

EDMONTON SERIES

Drumheller-Rosedale-East Coulee District.—The most fully developed area and the largest producers from this horizon are located in the Red Deer valley at Drumheller, Rosedale, and East Coulee. The seams worked vary in thickness from four to nine feet.

The Drumheller Consolidated Collieries, having acquired the equipment of the Scranton mine, have utilized this for the development of their holdings on the north side of the Drumheller valley. New property is being developed by a slope into the upper or Newcastle seam. It is proposed to sink to the lower or Drumheller seam at a later period.

Sheerness District.—Smaller operations are being carried on in this series at Sheerness, where the lower coal seams are mined by both stripping and shafts.

Three Hills-Ardley District.—The upper coal horizons of this formation are worked at Three Hills, Ardley, and several small country mines along the Red Deer river. The Carbondale Coal Company's mine at Ardley was closed down during the year.

Edmonton-Pembina District.—The largest installation on the seam is at Evansburg in the Pembina district on the main line of the Canadian National Railways, sixty miles west of Edmonton, and at Cardiff on the Edmonton, Dunvegan and British Columbia Railway. During the year the annual inspections have been carried out for the purpose of checking up quantities of coal extracted from the various leases on Dominion and School lands. Samples have been collected from some of the mines and analyses made at the Calgary office for the information of the operators.

Saskatchewan

During the year, in addition to the ninety-five regular inspections, many other visits were paid to mines for various causes. An Order in Council was passed authorizing settlers in certain districts to mine coal for their own use in vacant Dominion lands. The briquetting plant of the Western Dominion Collieries operated during the greater part of the year, and briquetting now appears to be established as a permanent industry in this district, a market being found for the briquettes in Winnipeg and elsewhere. It is pleasing to note that there were no fatal accidents during the year.

QUARTZ MINING

The coming into force of the new Quartz Mining Regulations on April 1, 1929, added to the duties of the staff of the Supervisory Mining Engineer, the inspection of mineral claims for certificates of work and improvements. This entailed the covering by the mining inspectors of large areas in northern and eastern Manitoba, and northern Saskatchewan, and from Rankin inlet on Hudson bay to Great Slave lake, Northwest Territories. On these trips, many of which were made by aeroplane, detailed information was collected regarding the organization, holdings and activities of the many mining and prospecting companies operating in the various areas.

For the benefit and convenience of prospectors and others engaged in the mining industry, it was decided to issue new, specially compiled maps of the mining districts tributary to The Pas. These maps, which were compiled in the Ottawa office, were prepared in subdivisions, according to international map scale, from aeroplane surveys, and details secured from sketches of claims staked, and from first-hand information gathered by close contact with the mining areas. Blue prints were run off and distributed through The Pas office. Owing to the growing activity in the Winnipeg district, particularly in the Rice Lake and Lac du Bonnet Mining division, a sub-office was opened in Winnipeg. During the year 57 claims were inspected for certificates of work, and 160 for certificates of improvement. Many of these inspections were made by canoe and outboard motors and 7,827 miles in 96 flying hours were covered by aeroplane.

PROSPECTING ACTIVITIES

The following five companies were active in prospecting in the Northwest Territories, Manitoba, and Saskatchewan:—

Northern Aerial Minerals Exploration Limited.—A number of this company's planes were in service, whose main activities were centered in the pre-Cambrian areas west of Hudson bay, with their base at Baker lake. Two other parties based at Oxford lake reported some interesting country east of God's lake on God's river, and in the vicinity of Red Sucker lake, Saskatchewan.

Dominion Explorers, Limited.—Planes belonging to this company were very active in the Northwest Territories, operating to the west of Hudson bay and along the Arctic coast from bases at Tavane, Baker lake, and the Burnside river (Bathurst inlet). The company acquired a group of claims at Axis lake, east of lake Athabaska. After doing considerable diamond drilling and trenching, operations were closed down, and the equipment moved farther north for the opening of the ensuing season.

Nipissing Mining Company.—Prospecting was confined by this company to the country tributary to Mistake bay, N.W.T., and to the Reindeer Lake area of Manitoba and Saskatchewan, where a large sulphide deposit is being drilled.

The Cyril Knight Prospecting Company.—This company had parties on Island lake, northern and eastern Manitoba, and on Rankin inlet on the west shore of Hudson bay, where assessment work was performed on four claims.

The Consolidated Mining and Smelting Company.—Prospecting was carried out by this company in the Bird River area of the Winnipeg mining district. In northern Manitoba, prospecting was more or less general, in areas closely adjoining the railways, but the number of stakings was below that of last year.

A number of claims were staked in the Lac du Bonnet and Rice Lake mining divisions of the Winnipeg mining district, and around Slate lake, and more or less generally throughout the gold areas along the Manigotagan and Wanipigow rivers. There was also some heavy staking in the early part of the year in the tin area around Bernic, Shatford, and Bird lakes, and later in the year, a few at West Hawk lake. About eighty claims were staked at East Braintree some seventy-five miles east of Winnipeg on a number of large sulphide dykes carrying some chalcopyrite.

There was greater activity in northern Saskatchewan than in the previous year. Heavy stakings were made at Forbes and Montgomery lakes and at lac La Ronge. The development of the lead-zinc deposits south of Pine point on Great Slave lake stimulated activities in the country tributary to the Mackenzie river, and a great increase in stakings was reported at Fort Smith.

CLAIMS RECORDED

The number of mining claims recorded by districts is given as follows:—

District	Jan. 1 to Dec. 31, 1929
The Pas mining district.....	1,972
Cold Lake mining district.....	601
Prince Albert mining district.....	1,041
Northwest Territories.....	469
Winnipeg mining district.....	2,185
Total.....	6,268 claims

PRODUCTION

The one producing property is that of the Central Manitoba Mines Limited at Long lake in the Rice Lake division of the Winnipeg mining district. This mine is about 100 miles northeast of the city of Winnipeg as the crow flies. It operated continuously throughout the year 1929, 58,810 tons of ore were hoisted and 54,674 tons treated in the cyanide mill, operating at a capacity of about 150 tons a day. Stopping was done at 125, 200, 250, and 375-foot levels; 51,365 feet of underground development work was done during the year, and 5,531 feet of holes drilled both underground and on the surface in exploration work.

MINES DEVELOPING

Hudson Bay Mining and Smelting Company.—This company displayed much activity throughout the year, 2,000 men were employed continuously and great progress was made in the construction of the concentrating plant, zinc refinery, crushing plant, power house, copper smelter, shaft house, and the various shops and other buildings. The main shaft, a five-compartment vertical shaft lined with steel, is now down to a depth of 650 feet; 106,000 tons of material of all kinds have been shipped in; 30,000 tons more remain to be shipped. The company expects to go into production early in 1931.

Sherritt-Gordon Mines, Limited.—These mines were active throughout the year. The main shaft, a five-compartment shaft inclined at an angle of 51

degrees, was sunk to a depth of 625 feet. Stations have been cut at the 250, 350, and 500-foot levels. Great progress has been made with the construction of the various mill buildings; 118 diamond drill holes have been put down to date totalling 41,614 feet, and the total length of shaft, drifting, cross-cutting and raising amounts to over 16,000 feet.

Mandy Mines Limited.—This mine is situated in The Pas mining district, about eighty miles north of The Pas, Manitoba. During 1929 development work was carried on continuously until early in December, when operations were suspended. The two-compartment shaft was put down to a depth of 1,025 feet. Drifting and cross-cutting was done on levels at 100-foot intervals. Total lateral work to date over 8,000 feet. Diamond drilling was done on the surface and underground on the tenth level. Thirty-five men were employed.

San Antonio Mines Limited.—This property was worked continuously throughout 1929, a force of twenty-five men being employed. The development work done in sinking, cross-cutting and drifting amounted to 2,788 feet. In working at the 725-foot level two well-defined veins were encountered. The results of the year's operations were very encouraging to the company. This property is in the Rice Lake mining division of the Winnipeg mining district at a distance of about 100 miles east of north of the city of Winnipeg.

Gem Lake Mines, Limited.—This mine was worked continuously through 1929. Development work in sinking, cross-cutting, drifting, slashing and station-cutting totalled 5,111 feet. Two veins have been cut on the 125, 250, 375, and 500-foot levels, carrying ore shoots averaging 3.5 feet wide. Results on this property to date have been encouraging. This mine is in the Rice Lake division of the Winnipeg mining district, about 40 miles southeast of the San Antonio.

Northern Lead Zinc Company Limited.—The properties of this company are located south of Pine point, Great Slave lake, N.W.T. Together with its affiliated prospecting company, the General Exploration Company, the Northern Lead Zinc Company Limited controls a total of 448 mineral claims in this area. A party of workmen was taken in to this property in March, 1929, and work has progressed continuously since. Sixty-nine test pits have been dug to date on four different areas to an average depth of fifteen feet; the average depth of boulder clay is given as from seven to nine feet. The ore occurs in sink holes in the Presqu'île dolomite. It is a high-grade mixture of galena and sphalerite. Sufficient work has not been done to establish the vertical thickness of the deposits, but it is believed that the area which will be found to be occupied by the deposits will be very considerable.

Jack Nutt Mines Limited.—Operations were carried out by this company throughout 1929 at Bernic lake, Lac du Bonnet mining division, Winnipeg mining district. A two-compartment shaft was sunk to a depth of 170 feet and four holes drilled on a pegmatite dyke containing some cassiterite. A radiore survey was made of claims at Bernic lake and at Rush lake.

Manitoba Tin Company, Limited.—This company sank a shaft to a depth of 100 feet on a pegmatite dyke at their properties on Shatford lake. About 300 feet of cross-cutting and drifting was done at the 100-foot level. Operations were suspended in November, 1929.

SURFACE EXPLORATION WORK

Many companies and syndicates confined their attention during the year to trenching and surface exploration work of their holdings, in the Winnipeg and The Pas mining districts in the province of Manitoba.

OPTIONS WORKED

The Consolidated Mining and Smelting Company optioned and drilled the Don Jon claim of Flintoba Mines Limited at Thompson lake. The Consolidated Mining and Smelting Company also optioned and drilled the Davidson Montgomery claims at Forbes lake. Late in 1929 this company took an option on the Lynx group of claims on Oxford lake and sent a party of eight men to this property to open up test pits for sampling purposes.

Ventures Limited optioned and put eighteen diamond drill holes down on the Matson Adair holdings at Hyres Island, Oxford Lake, early in 1929.

Towards the close of the year the Mandy Mines Limited optioned the Baker Patton holdings of the Callinan Flin Flon Mines Limited at Sourdough bay and did 4,000 feet of diamond drilling.

III

FORESTRY

REPORT OF THE DIRECTOR OF FORESTRY, E. H. FINLAYSON

In the year under review agreements were signed with the western provinces for the return of the natural resources, including the forests. This action will relieve the Forest Service of its former administrative functions with regard to the protection and management of forest lands. The change will enable it to concentrate on investigation, research, and experiment, and to give leadership to the provinces and the forest industries. In particular this Service will be in a position to avail itself of the additional opportunities which are presented for investigation into basic forest-protection problems, for silvicultural researches into the rates and conditions of growth of Canadian tree species, for forest-products research looking to the closer utilization of Canadian raw materials, and for the more intensive prosecution of the national inventory of forest resources now actively under way.

The forest fire situation in Canada during the year 1929 was one of the most severe ever experienced and might easily have been the most disastrous in our history but for the development in protection facilities which has taken place in recent years. The area most affected extended from western Ontario to the Pacific coast. Throughout that region snowfall during the two preceding winters had been very deficient. In addition the spring and summer of 1929 were characterized by almost complete lack of rain. This condition, combined with extended periods of high winds, created an unparalleled drought situation throughout Western Canada. The expenditure on fire fighting alone was almost \$1,250,000, the highest on record in the history of fire protection in Canada.

The following table, compiled by the Forest Service from returns made by the different forest authorities, gives in detail the figures of forest fires in Canada for the year 1929 as compared with the average for the five-year period 1925-29 inclusive.

Item	Year 1929	Average per year 1925-1929 inclusive
Total number of fires.....	6,685	5,146
Total area burned over (acres).....	6,030,749	2,319,074
Merchantable timber—		
Area burned (acres).....	674,226	376,223
Timber burned (M ft. B.M.).....	508,715	455,125
{ cords.....	2,005,386	1,634,821
Estimated stumpage value.....	\$2,379,582	\$ 2,532,868
Young growth—		
Area burned (acres).....	1,023,111	531,836
Estimated value.....	\$2,004,759	\$ 1,013,925
Cut-over—		
Area burned (acres).....	340,225	172,161
Estimated value.....	285,569	\$ 130,002
Non-forested—		
Area burned (acres).....	4,128,901	1,275,283
Other property burned—		
Value.....	\$ 301,499	\$ 441,883
Actual cost of fire-fighting.....	\$1,239,345	\$ 630,624
Total gross damage and loss.....	\$6,210,754	\$ 4,749,302

In accordance with an undertaking made to the provinces at the national forest inventory conference in June, 1929, the Research Division of the Forest Service concentrated its work largely on the inauguration of rate-of-growth studies in the main forest regions of Eastern Canada. The usual research activities were, however, continued at the forest experiment stations at Peta-wawa, Lake Edward, and elsewhere. In addition, a new experiment station was instituted at the forest nursery at Indian Head, Saskatchewan, dealing largely with pathological problems of Western Canadian species. The Forest Products Laboratories, having become settled in their new sites, turned their activities to carrying out research programs the scope of which it has been possible to enlarge considerably by reason of increased staff and equipment.

NATIONAL INVENTORY OF FOREST RESOURCES

At the conference of the federal and provincial forest authorities held in Ottawa, June 25 to 27, 1929, it was decided to conduct a national inventory of forest resources. The provincial authorities administering forests undertook to carry on the work in their respective provinces, and the Dominion Forest Service to conduct the inventory in the Prairie Provinces and to co-operate with and assist the other provinces as far as means were available. It was also agreed that the Forest Service should act as a clearing-house for information regarding the existing forest resources and their depletion and increment, the provinces furnishing reports of surveys and investigations as completed. The completion of the inventory (of the accessible area, at least) in five years was set as an objective.

Pursuant to the scheme adopted by this conference the Forest Service immediately commenced the inventory in the three Prairie Provinces by detailing a forest officer in each to collect and compile all existing data, examine areas concerning which reliable information was lacking, and keep records of depletion due to cutting, fire, etc. In 1929 three stock-taking survey parties were placed in the field in Manitoba and one in Saskatchewan, and in 1930 there will also be one in each of these two provinces.

Each province has been divided into a number of districts based primarily on drainage areas, and for each of these districts separate reports are being compiled showing the classification of the area as to tenure (privately owned, leased, or unalienated), farm land, waste land, and non-productive or productive forest. The latter is subdivided into softwood, hardwood, and mixed types of merchantable timber and young growth. The areas of virgin forest and cut-over and burned-over land are also recorded. An estimate of the amount of timber of merchantable size suitable for lumber, pulpwood, ties, poles, posts, etc., of each species is being compiled. The annual cut for all purposes and the losses from fire, insects, and disease are being estimated as closely as possible.

As a result of the extensive forest surveys conducted in Manitoba during the last four years, the inventory in that province is well advanced and there is every prospect of completing it within the five years set, but in Saskatchewan and Alberta there are such large areas for which the information is very meagre or altogether lacking that this may not be the case.

Aerial photography has been of the greatest assistance in these inventories, especially when used in conjunction with ground surveys. Maps are prepared from the photographs which not only give accurate topographical details, but show the waste land, merchantable timber, and young growth of the various types. With experience, the interpretation of aerial photographs is becoming much more efficient and it is confidently expected that with additional research along the lines started it will be possible by this means, supplemented by a minimum of ground cruising, to determine, within a reasonable degree of accuracy, the extent of the forest resources over areas in which intensive ground surveys would entail large expenditures of time and money.

As part of its co-operation with the provincial services the Dominion Forest Service is conducting a series of surveys in each province to determine the kind and amount of natural reproduction which is taking place after cutting and fire, and the rate at which this young timber is growing.

Information being obtained through this inventory will make it possible to devise forest policies adapted to the varying forest conditions throughout Canada which will ensure to the forest industries continuous and economical production.

FIRES AND FIRE PROTECTION

All inspectorates report a very hazardous fire season.

In Manitoba the 1929 season, which lasted until the second week of October, was the longest ever experienced, and the worst since the inauguration of organized fire-fighting. The snowfall during the winter of 1928-9 was light; there was practically no spring rainfall, and the prolonged warm weather of the summer was accompanied by high winds. The loss was comparatively light, except on the east side of lake Winnipeg. Aerial co-operation was hindered somewhat by weather conditions and shortage of equipment, and static interfered to some extent with the use of the radio. Aircraft equipped with skis were used during the late winter and early spring. The total time of flying during April and May, 1929 (under winter conditions) was 176 hours; between May and November, inclusive, a total of 2,607 hours flying was done.

In Saskatchewan the hazard was intense from early spring until late autumn, being even worse than it was during the preceding season. The causes were practically the same as those operating in Manitoba, namely, the dry season of 1928 followed by a winter in which there was little or no precipitation, and a very warm, dry summer with unusually high winds. The fire loss within the national forests was greater than it had been during the two preceding seasons. In the fire-ranging districts, many fires were difficult of access, and could only with difficulty be prevented from spreading. Co-operation with the Civil Government Air Operations staff continued good; a total of 930 hours flying was done. Thirty-seven ground fires were extinguished during the late winter.

In Alberta the fire risk reached its climax in the summer, from the latter part of July on, when the situation in the southern forests of the east slope of the Rockies was fully as bad as those of 1910 and 1919; the first week of September, however, brought relief. In the Cooking Lake national forest and the southern part of the Edmonton fire-ranging district the hazard continued excessive from May till December. In the earlier part of the season, practically no risk was experienced during April. In the latter half of May rains in that part of the province south of the North Saskatchewan river relieved the hazard in southern Alberta, though in the northern part of the province a very acute risk developed. Rains in the middle of June alleviated the hazard except in the Cooking Lake forest and the southern part of the Edmonton fire-ranging district. With the exception of the region just named, the fire risk during the autumn was below the average. Intensive air patrol was necessary on account of the long period of high fire-hazard and the unfinished condition of the lookout units on the Crowsnest and Bow River forests. A total of 1,078 hours of flying was required—644 from the High River base and 434 from the Grande Prairie sub-base.

In British Columbia the fire-hazard was abnormally high. The absence of snowfall and the early spring contributed to this result, though the risk was not out of the ordinary until the last part of July. During the two months succeeding, the conditions were very bad, but after September returned to normal. The very great majority of the fires were of comparatively small extent but three which could not be controlled, in spite of the most strenuous work, were

the cause of a large proportion of the season's fire loss. The railways caused most fires, but these were all small in area and were soon extinguished. Lightning was the second greatest cause of fires, and incendiary, which came third, is still the cause of a serious number of fires (almost ten per cent).

In the tables that follow are given the fire-statistics for the 1929 season:—

Table No. 1

FIRES WITHIN AND OUTSIDE NATIONAL FORESTS: AREA BURNED OVER AND FIRE LOSS BY CAUSES

Causes	Manitoba			Saskatchewan			Alberta			British Columbia			Totals		
	No.	Area	Damage	No.	Area	Damage	No.	Area	Damage	No.	Area	Damage	No.	Area	Damage
		acres	\$		acres	\$		acres	\$		acres	\$		acres	\$
Camp-fires.....	223	601,305	260,238	125	122,322	78,427	113	61,883	71,544	28	3,086	6,111	489	788,596	416,320
Smokers.....	55	11,130	6,615	33	9,774	848	34	4,001	2,330	60	3,227	24,327	182	28,132	34,120
Settlers.....	75	69,342	10,287	179	326,727	381,307	64	89,333	69,448	29	2,511	4,464	347	487,913	465,506
Railways.....	89	227,043	153,233	44	21,112	12,419	129	5,308	13,465	132	625	61	394	254,088	179,178
Lightning.....	79	2,164,624	245,275	18	72,090	110,688	8	589	4,028	127	26,546	215,862	232	2,263,849	575,853
Industrial operations.....	3	36	4	28	90,018	96,686	5	7	.....	16	4,342	21,300	52	94,403	117,990
Incendiary.....	64	38,690	17,054	61	50,773	41,084	14	20,943	4,912	45	3,511	19,299	184	113,917	82,349
Public works.....	8	64,625	23,177	1	1,800	1,440	7	5,233	2,270	5	804	1,875	21	72,577	28,762
Unclassified.....	3	6,341	9,191	8	13,772	14,240	1	1	500	4	161	60	16	20,200	23,991
Unknown.....	61	221,688	105,412	20	33,879	48,852	21	87,512	211,638	14	2,277	11,558	116	345,356	377,460
Total.....	660	3,404,824	830,486	517	742,307	785,991	396	274,810	380,135	460	47,090	304,917	2,033	4,469,031	2,301,529
Total cost of suppression.....	.....	.....	150,989	.....	.....	112,570	.....	.....	60,591	.....	.....	69,642	.....	.....	393,792
Total fire loss.....	.....	.....	981,475	.....	.....	898,561	.....	.....	440,726	.....	.....	374,559	.....	.....	2,695,321

Table No. 1a

FIRES WITHIN AND OUTSIDE NATIONAL FORESTS: FOREST CONDITION OF BURNED-OVER AREAS, EXPENDITURE FOR FIRE-FIGHTING, ETC.

Province	Non-forested	Young growth	Cut-over land	Merchantable timber		Expenditure for fire fighting			Fires under jurisdiction Railway Board		
				Area	Value	Ranger Service	Other expenditure	Total	No.	Area burned	Loss
				acres	\$	\$	\$	\$	acres	\$	
Manitoba.....	2,898,696	219,257	21,366	265,505	406,480	6,937	144,052	150,989	43	1,242	200
Saskatchewan.....	334,466	261,730	24,100	122,011	276,849	9,092	103,479	112,570	23	15,305	10,536
Alberta.....	114,958	110,931	1,562	47,359	183,408	5,095	55,496	60,591	123	508	1,022
British Columbia (Railway Belt).....	5,474	11,804	7,630	22,182	234,496	5,303	64,338	69,641	96	503	163
Total.....	3,353,594	603,722	54,658	457,057	1,081,233	26,427	367,365	393,791	285	17,558	11,921

Table No. 2

FIRES WITHIN NATIONAL FORESTS: NUMBER AND AREA BURNED, BY CAUSES

Causes	Manitoba		Saskatchewan		Alberta		British Columbia		Totals	
	Number	Area	Number	Area	Number	Area	Number	Area	Number	Area
		acres		acres		acres		acres		acres
Camp-fires.....	19	4,226	38	62,190	11	1,548	10	2,972	78	70,936
Smokers.....	10	2,843	6	1,446	12	72	13	995	41	5,356
Settlers.....	5	712	123	99,415	.....	.....	1	3	129	100,130
Railways.....	.....	.....	25	5,138	5	3	2	55	32	5,196
Lightning.....	2	803	2	1,065	5	4	15	2,584	24	4,456
Industrial operations.....	2	36	1	.....	3	1	.....	.....	6	37
Incendiary.....	48	28,132	22	16,525	3	17,267	31	3,177	104	65,101
Public works.....	1	640	1	1,940	1	21	.....	.....	3	2,501
Unclassified.....	.....	.....	1	.....	1	1	2	81	4	82
Unknown.....	9	4,029	8	3,680	4	61,341	1	2	22	69,652
Total.....	96	41,421	227	191,299	45	80,258	75	9,869	443	322,847

Table No. 3

FIRES OUTSIDE NATIONAL FORESTS: NUMBER AND AREA BURNED BY CAUSES

Causes	Manitoba		Saskatchewan		Alberta		British Columbia		Totals	
	Number	Area	Number	Area	Number	Area	Number	Area	Number	Area
		acres		acres		acres		acres		acres
Camp-fires.....	204	597,079	87	60,132	102	60,335	18	114	411	717,660
Smokers.....	45	8,287	27	8,328	22	3,930	47	2,232	141	22,777
Settlers.....	70	68,630	56	227,312	64	89,333	28	2,508	218	387,783
Railways.....	89	227,043	19	15,974	124	5,305	130	570	362	248,892
Lightning.....	77	2,163,822	16	71,025	3	585	112	23,962	208	2,259,394
Industrial operations.....	1		27	90,018	2	5	16	4,342	46	94,365
Incendiary.....	16	10,557	39	34,248	11	3,676	14	334	80	48,815
Public works.....	7	63,985			6	5,212	5	804	18	70,076
Unclassified.....	3	6,341	7	13,772	0		2	80	12	20,118
Unknown.....	52	217,659	12	30,199	17	26,171	13	2,275	94	276,304
Total.....	564	3,363,403	290	551,008	351	194,552	385	37,221	1,590	4,146,184

Table No. 4

CLASSIFICATION BY SIZE OF FIRE

Province	Class A (under 1/2 acre)		Class B (1/2 acre and over, but under 10 acres)		Class C (10 acres to 500 acres)		Class D (over 500 acres)		Totals, 1929-1930		Totals, 1928-1929	
	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent by provinces	Total number of fires	Per cent Class A
	Manitoba.....	35	5.3	150	22.7	257	38.9	218	33.0	660	32.6	380	17
Saskatchewan..	101	19.5	98	18.9	174	33.8	144	27.8	517	25.4	320	16
Alberta.....	137	34.6	94	23.7	105	26.5	60	15.2	396	19.4	396	14
British Colum- bia (Railway Belt).....	147	32.0	213	46.0	85	19.0	15	3.0	460	22.6	475	65
Totals....	420	20.0	555	26.0	621	32.0	437	22.0	2,033	100.0	1,571	30

Table No. 5

DISTRIBUTION BY MONTHS

Month	Manitoba		Saskatchewan		Alberta		British Columbia		Totals	
	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent
April, 1929.....	15	2.3	15	2.8	49	12.4	15	3	94	4.6
May.....	140	21.2	227	44.0	102	25.7	39	8	508	25.0
June.....	101	15.3	59	11.4	60	15.1	22	5	242	11.9
July.....	103	15.6	14	2.7	60	15.1	187	41	364	17.9
August.....	181	27.4	79	15.3	19	4.8	151	33	430	21.1
September.....	50	7.6	22	4.2	31	7.9	43	9	146	7.1
October.....	65	9.8	60	11.6	40	10.1	3	1	168	8.3
November.....	5	0.8	4	1.0	34	8.6			43	2.1
December.....					1	0.3			1	
January, 1930.....			6	1.0					6	0.3
February.....			16	3.1					16	0.8
March.....			15	2.9					15	0.7
Totals.....	660	100.0	517	100.0	396	100.0	460	100.0	2,033	100.0

Table No. 6

STATEMENT OF THE AMOUNT OF TIMBER AND OTHER PROPERTY DESTROYED

Province	Salvable timber			Unsalvable timber			Damage to timber		Damage to young growth		Damage to other property		Total damage
	Saw-timber	Other	De-precia-tion	Saw-timber	Other	Dam-age							
	Ft. b.m.	cords	\$	Ft. b.m.	cords	\$	\$	%	\$	%	\$	%	\$
Manitoba....	493	53,940	14,422	44,318	855,867	384,998	399,420	48.1	409,073	49.3	21,993	2.6	830,486
Saskat-chewan.....	20,755	355,073	80,365	10,426	511,594	196,482	276,847	35.2	490,998	62.5	18,146	2.3	785,991
Alberta.....	16,453	1,302	15,862	64,786	96,570	147,546	163,408	42.9	212,959	56.1	3,768	1.0	380,135
Br. Columbia (Dominion Lands).....	3,384	37,442	10,555	112,484	49,500	242,941	253,496	83.2	21,248	6.9	30,173	9.9	304,917
Totals...	41,085	447,757	121,204	232,014	1,513,531	971,967	1,093,171	47.4	1,134,278	49.4	74,080	3.2	2,301,529

Table No. 7

STATEMENT OF DOMINION LANDS BURNED OVER, SHOWING OWNERSHIP AND FOREST CONDITIONS

Province	Total area burned over	Ownership				Forest conditions							
		Public		Private		Merchant-able timber		Partially cut-over		Young growth		Not forested	
		acres	%	acres	%	acres	%	acres	%	acres	%	acres	%
Manitoba.....	3,404,824	3,387,513	99.5	17,311	0.5	265,505	7.7	21,366	0.6	219,257	6.4	2,898,696	85.3
Saskatchewan.....	742,307	600,757	80.8	141,550	19.2	122,011	16.4	24,100	3.2	261,730	35.2	334,466	45.2
Alberta.....	274,810	262,155	95.4	12,655	4.6	47,359	17.2	1,562	0.5	110,931	40.4	114,958	41.9
British Columbia (Railway Belt).....	47,090	41,884	88.9	5,206	11.1	22,182	47.1	7,630	16.2	11,804	25.1	5,474	11.6
Totals.....	4,469,031	4,292,309	96.1	176,722	3.9	457,057	10.2	54,658	1.2	603,722	13.5	3,353,594	75.1

FIRE-HAZARD STUDIES

As in previous years, weather records were taken throughout the fire season at a number of selected stations in forest areas in the Prairie Provinces and the Railway Belt of British Columbia. The data obtained at these stations proved of material value to fire-protective organizations in the direction of fire patrols and suppression work.

In addition to the foregoing, fire-hazard research studies were continued at the Petawawa forest experiment station at Chalk River, Ontario, with the object of studying the degree of inflammability of forest-fire fuels (the materials on the forest floor in which fires start or spread) under varying conditions of moisture content. As a result of this work, it is now definitely known precisely what effect a given set of weather conditions has upon the inflammability of the forest fuels in the white pine and red pine type. The information thus obtained proved of great value in accurately determining the condition of inflammability of the forest each day and was useful in detailing the work of the men so that they would be immediately available in the event of a fire being reported. It was also used in determining the necessity of keeping men on duty on Sundays, the number of men necessary to send to a fire, and in posting warnings at the entrance to the forest reserve for the guidance of visitors in the use of fire.

The procedure consisted in establishing five zones of inflammability for mixed red and white pine forest ranging from nil to extreme, depending upon the moisture content of the fuels. The behaviour of fires in each zone was

identified. The rates of change of moisture content and consequently the inflammability, under varying conditions of rainfall, wind velocity, relative humidity of the air, temperature, and evaporation, were determined for the mixed red and white pine forest in the climatic area of the Petawawa forest experiment station.

IMPROVEMENTS

Hereunder is a list of the principal improvements made during the year:—

	Number		Miles
Ranger house.....	1	Telephone lines.....	154
Ranger cabins.....	21	Roads.....	49
Stables.....	5	Trails.....	200
Warehouses.....	2	Fireguards (ploughed).....	339
Garages.....	2	Fireguards (cleared).....	107
Barns.....	5		
Machine sheds.....	2		
Lookout cabins.....	2		
Lookout towers.....	4		
Bridges.....	6		
Summer-resort pier.....	1		
Golf course.....	1		
Fences.....	5		
Cableway.....	1		
Nursery water systems.....	4		
Other buildings.....	13		

HAY AND GRAZING

In Manitoba the grazing situation improved somewhat, and the demand for hay was keen owing to the poor hay crop brought about by the dry weather. Practically all the hay meadows in the national forests were cut over.

In Saskatchewan there was a decided increase in the number of hay permits issued, the dry weather permitting the cutting of hay meadows usually flooded. Grazing, however, is decreasing owing to the fact that the farmers are more and more inclined to engage in mixed farming and raise their own forage crops. In Alberta more sheep but fewer cattle and horses were grazed.

In British Columbia weather conditions (in particular the small snowfall of the preceding winter, 1928-29) were unfavourable for grazing. With the idea of encouraging stockmen to use the higher ranges, several trails were constructed and other improvements made.

TIMBER SALES AND PERMITS

In Manitoba five timber sales were carried on. The number of timber permits was slightly smaller and practically all of them were in the Riding Mountain, Duck Mountain, and Porcupine forests.

In Saskatchewan there was a slight increase in timber sales and permits. Thirty-two new sales (twenty-six "Supervisor's," five "Inspector's," and one "Director's") were awarded. There was a brisk demand for timber permits, especially on the prairie reserves. Very little pulpwood was cut. Owing to the dry season, great care was required in supervising brush-burning operations but practically all the brush was burned.

In Alberta ten new sales were awarded during the year and thirteen sales were closed out. The total cut was slightly less than last year's total, but is above the five-year average. The number of permits issued was 673. There was an increase in the quantities of fence-posts, fence-rails, poles and fuel-wood. The cut of sawlogs was stationary and there was a decrease in the cut of mining timber and thinnings.

In British Columbia the season was very active in regard to timber sales, nineteen new sales being awarded. The greatest demand was for poles and piling; the demand for sawlogs was small and only a few ties were cut. Sale conditions were well complied with.

REFORESTATION

In Manitoba 47,500 trees were set out on the Riding Mountain forest, but no seeding was done. Sprinkling systems worked satisfactorily at all the nurseries and a total of 2,429,400 young trees is on hand.

In Saskatchewan 46,000 trees (14,000 white spruce and 32,000 jack pine) were set out on the Dundurn, Nisbet-Pines, and Big River forests. The excessive mortality of jack pine planted in the autumn of 1928 showed that fall planting of jack pine was not a success. In the nurseries growth was hindered by dry weather. The number of seedlings on hand is 5,435,397, and the number of transplants 749,672. A detailed nursery cost system was introduced in 1928, and it is found that the cost of seedlings is on a par with similar nursery stock in the United States, but the cost of transplants is excessive.

In Alberta 50 acres of spruce and 25 acres of lodgepole pine were planted in the Cooking Lake forest. There has been much damage from rabbits and a rabbit-proof fence has been erected around the area planted to pine. Older plantations are doing well. For planting in 1930 there are on hand 180,000 spruce and pine seedlings and 10,000 transplants.

RECREATION

In Manitoba the number of visitors at the summer resorts in the national forests showed a marked increase; the estimated daily total number of visitors at all these resorts amounted to 1,400. Improvements made include the clearing of four acres of land at Benito Beach and two acres at Kamsack Beach, the construction of a promenade along the lake at the latter resort, and the laying out of two additional tennis courts, a pier, and a bath-house. At the Clark Beach (Riding Mountain) resort a nine-hole golf course was constructed and throughout all the summer resorts much road-improvement work was done.

In Saskatchewan the resorts continue to be popular, especially at Fish Lake (Moose Mountain), where fifty additional lots were laid out in the Sandy Bay subdivision. Fishing permits issued in this forest showed a substantial increase in number.

In Alberta the Elkwater Lake resort, the only one in this inspectorate, has a steadily increasing number of visitors, and the camping grounds in the mountains continue popular in summer and autumn.

In British Columbia both the Paul Lake and the Fish Lake resorts continue popular, though no great demand has been experienced for camp or cottage lots. Attention is being given to camping sites along the automobile highways in the national forests. The ditch connecting Walloper Lake and Fish Lake has been found useful in providing spawning grounds for the trout and raising the level of Fish Lake.

SURVEYS

In Manitoba the surveys of pulpwood resources were continued by three parties, two in the Nelson River drainage area and one in the Saskatchewan River drainage area. A total of about 4,262,000 acres was covered, of which 1,562,000 acres were in the Nelson area and 2,700,000 acres in the Saskatchewan area.

In Saskatchewan three 4-man crews were engaged in an inventory survey in the Pasquia forest. Though their work was interrupted by fire, they succeeded in covering 128,000 acres. During the winter a 2-man party cruised 9,406 acres in the Fort à la Corne forest.

In Saskatchewan, on account of heavy demands from prospective settlers for the opening of lands in national forests and proposed additions thereto,

examinations were made of these lands and 66½ sections were withdrawn from the forests; five townships were also withdrawn as the result of examination by officers of the Department.

MANITOBA FOREST INVENTORY

Preliminary work was done in the matter of making a forest inventory of Manitoba, consisting of a general tour of the settled portions of the province, preparation of a plan for future work, special subdivision of the province into districts, compilation of the 1927 cruise of the pulpwood area and a set of maps of the 1928 and 1929 fires, and compilation of data on land tenure. The Bureau of Statistics co-operated in the preparation of a list of sawmills.

SEED COLLECTION AND EXTRACTION

In Manitoba there was a heavy crop of Manitoba maple seed, and 3,058 pounds were collected at Dauphin and sent to Indian Head, Saskatchewan, for extraction.

In Saskatchewan 128 bushels of jack pine cones and 125 bushels of white spruce cones were collected, yielding, respectively, 58 and 86 pounds of seed. The cost of the jack pine seed was higher than usual, but the white spruce seed cost little more than half that extracted in 1927. Ten pounds of balsam fir seed were also procured.

In Alberta the crop of spruce and balsam fir cones was very poor and collection was not feasible; 200 pounds of lodgepole pine seed were extracted from cones collected in previous years.

The demand for British Columbia seed continued, and two and one-quarter tons of seed were sent to the British Forestry Commission. Large orders from the Irish Free State, New Zealand, and Australia were also filled, and Norway, Sweden, Finland, Denmark, Spain, and Russia were sent small lots. Although the crop of coast Douglas fir seed was a failure and that of lowland fir was not satisfactory, the crops of other varieties of seed were some of the best on record, especially Sitka spruce, the season's yield of this seed being the best since this Service started the work of seed collecting. All picking was done by contract. The total quantity of seed extracted amounted to five and a quarter tons—the yield of about thirteen carloads of cones. The quality of seed was unusually good, as high as 96 per cent germination being obtained in one shipment of yellow pine seed.

TREE PLANTING ON PRAIRIE FARMS

Exceptional weather conditions owing to drought, heat, and extensive wind-storms made the season of 1929 the most unfavourable experienced by the Tree Planting Division since the beginning of its work. Following upon a winter of light snowfall, conditions were fairly good during the spring, but during the remainder of the season there was an almost complete lack of precipitation. Abnormal temperatures in January and February led to an unusual amount of winter-killing; of all the species ash was the least affected. Lighter soils suffered less than the heavier clay soils. Established evergreens came through in good condition and broad-leaved rooted stock sustained little loss; cutting stock, however, suffered very heavily. Of the plantations two years old and over, 81½ per cent were rated good, 15½ per cent fair, and only 3 per cent poor. Owing to the drought the growth was somewhat less than usual. Field shelter-belts are increasing in number, and their benefits are being perceived. In at least one case reported a field shelter-belt about four feet high saved the crop on the sheltered side when the crop on the exposed side was a complete failure. Observations of mulching show this practice faulty. Mulching

increases the fire risk, but a cultivated strip acts as a fireguard and also adds to the area from which trees can draw moisture in case of drought. Greater interest is everywhere reported in ornamental trees, shrubs, flowers, lawns, and fruit trees. A total of 8,673,650 broad-leaved seedlings (approximately half from each of the Indian Head and Sutherland nurseries) was sent out to 6,486 applicants, and 138,700 transplants of pine and spruce were sent to 966 applicants, in addition to which 118,000 trees were sent to the Spruce Woods forest for planting there. The broad-leaved nursery stock is smaller than usual but well rooted. The evergreen seed-beds have come through very satisfactorily owing to artificial watering.

Much attention was given to the research work at the Indian Head station. A start was made in obtaining complete plotting and measurement records in all the permanent plantations at Indian Head. Eighteen plantations whose areas totalled 31.72 acres were surveyed, every tree being measured and plotted. Some of these were also marked for thinning. Observations were made in a number of cases of the results of mixing different species. A mixture of ash and Scotch pine proved almost ideal under the conditions obtaining at the nursery. Mixtures of Manitoba maple with other species were generally beneficial, though in some cases the maple did harm by shading and mechanical damage. A mixture of caragana and white spruce has proved detrimental to the spruce, and jack pine has also suffered badly from its mixture with caragana. In the mixtures of caragana with lodgepole pine and with Colorado spruce, damage done by the caragana has not been so evident.

A number of "variety" plots were also measured for diameter and height, and some of them were thinned. Many height measurements were made in both plantations and "variety" plots. The trial of exotics was continued; in the nursery rows there are now 1,772 plants of 71 species of these and the transplant beds include 941 plants of 36 species. Studies of the effect on grain crops of a field-shelter were carried out at a farm in the vicinity of Indian Head. In the case of oats and barley very striking benefits were noted to a distance of 65 or 75 feet from the shelterbelt, and in that of wheat to about the same distance.

The study of poplar canker was continued. Two types of this disease were found, one of which injures the young cuttings in the nursery, the other appearing on older plantations. Clean cuttings planted in clean ground were found to give trees free from the disease. A fungus was discovered which seems to be the cause of the disease, which has been proved to live over winter in the cuttings and to continue growth next spring after planting. In a typical lot of cuttings taken from the ordinary run of stock sent out from the nursery, over 40 per cent failed to survive. Ocular inspection is sufficient to select clean cuttings, which must be planted in clean ground. The other form of canker—that which affects the adult trees—is perpetuated by a fungus which is comparatively well known, but the fungus which originates the disease is not yet known. Further investigation of this disease is being carried on. A study of "damping off" is being carried on in coniferous seed-beds.

A mimeographed circular describing a simple and practical method of preservative treatment for fence-posts was issued in response to many inquiries received from the farmers throughout the Prairie Provinces, great interest having been aroused from the fact that the first lot of Russian poplar posts creosoted in 1916 are now, after thirteen seasons in the ground, apparently in as good condition as when originally set out.

Tests of apples and plums grown under the protection of shelter-belts were continued at Indian Head, and a variety of gooseberry similar to the English gooseberry and much larger and of better quality than the kinds usually grown on the prairies holds out great promise. Tests of apples and plums are also being carried on at Sutherland.

FOREST PRODUCTS LABORATORIES OF CANADA

Since the reorganization of the laboratories at Ottawa and Montreal has been completed and these laboratories have become well established in their new quarters, all three laboratories have made satisfactory progress. The past year was one of exceptional activity. Increasing interest in the work of the laboratories has been manifested by the wood-using industries, a fact which provides an important incentive to the staffs of the laboratories.

OTTAWA LABORATORY

The Ottawa Laboratory is now organized under the divisions of wood preservation, timber mechanics, timber physics, timber pathology, wood utilization, lumber seasoning, markets and exhibits, and office administration.

Division of Wood Preservation.—Tests were begun of a new preservative known as zinc-meta-arsenite. Eleven hundred ties were provided by the Canadian National Railways and treated by the Laboratory, and are being installed in the track, where they will be kept under observation; tests were also made as to permanency of this preservative under leaching conditions, corrosive effect on metals, and toxicity to fungi. The Canadian Pacific Railway provided 1,220 ties, and tests made on these, after being air-seasoned and creosoted, proved that incising prior to air-seasoning slightly reduces checking in ties seasoned from four to five months but has no appreciable effect on the rate of air-seasoning or on the absorption of preservative as compared with ties incised after air-seasoning. Incidentally to this work it was found that yellow birch ties should be treated separately from maple and beech ties, though ties of these latter two species may be seasoned together. Studies in the distribution, penetration, and permanency in wood of dinitrophenol (a constituent of Wolman salts), a preservative much used in several countries, are in progress, as is also work on the use of sodium chloride (common salt) as a wood preservative under certain conditions. Work on the protection of timber from marine borers is still being carried on.

Division of Timber Mechanics.—A new project being taken up in this division is the testing of glues for the purpose of developing glue standards. Further study of the strength of wooden containers is being carried on, and a survey of packing methods and materials used by leading manufacturers of western and southwestern Ontario has been completed. A study of the relation between rate of growth and crushing strength and between density and crushing strength was carried on. This division and the division of timber pathology are co-operating in investigation of the strength of jack pine as influenced by *Trametes Pini* and a second fungus that causes red stain in jack pine. A series of tests (4,326 in all) was carried on with Eastern cedar, red pine, and jack pine in order to ascertain the suitability of the pines for use as telephone poles. Tests on clear specimens of Canadian woods and on the nail-holding power of Canadian woods were continued. Strength tests of treated and untreated Douglas fir beams showed that though, generally speaking, some decrease in strength was shown after treatment the decrease was not sufficient to limit their usefulness or serviceability from a commercial standpoint. A number of minor investigations were made. A total of 15,430 tests was made during the year under various projects, and 2,159 tests in response to inquiries from wood-using industries.

Division of Lumber Seasoning.—Kiln-drying tests on white pine point to the development of a method of avoiding brown-stain in drying. Plans were drawn up for a lumber-seasoning survey in lumber-manufacturing and wood-

working plants in Quebec and the Maritime Provinces. Investigation of the absorption of moisture in rail transportation of kiln-dried stock from British Columbia to Eastern Canada was made in co-operation with the Vancouver laboratory.

Division of Timber Physics.—Several studies of timber flotation were carried on. Reports were made to the Woodlands Section of the Pulp and Paper Association, at their request, on the Laboratory's investigations regarding the decrease of floatability in logs which had been soaked in water in a tank for almost a year, and on the effect of agitation on the rate of absorption of water by logs. The effect of water temperatures on the sinkage of wood in fresh water was investigated, the result being that no apparent difference was found in the rate of sinkage of logs where the water remains either cold or warm, but that the rate of sinkage seems to be faster in logs which are subject to varying water temperatures. The collection of microscopic preparations of Canadian woods was extended, and many wood identifications made. Microscopic preparations of Canadian woods were sent to three Canadian universities and one technical school. An investigation of electrical resistance in wood was initiated, and a number of minor investigations carried out.

Division of Timber Pathology.—Blue-stain in lumber, particularly white pine, was investigated in several aspects. A study of the general conditions under which blue-stain occurs and of means of preventing it was made, and a short circular published on this subject. A systematic study of blue-stain fungi was begun and tests made of twelve selected toxic chemicals to determine which of them will control blue-stain. Brown-heart in birch is also being investigated. In response to a request, mora, a heavy South American hardwood which has been suggested for use as railway ties, was tested and found apparently durable. The reference collection of pathological material was extended and study of the development of red-stain in jack pine ties under service conditions was continued.

Division of Wood Utilization.—This division was engaged on another aspect of the log-flotation question, namely, the effect of seasoning on the floatability of logs, a report on which was made at the 1930 meeting of the Woodlands Section of the Pulp and Paper Association. An official report on the relationship between rate of growth and density in spruce was drafted. Plans were prepared for a systematic study of sawmill waste in eastern Canada, and co-operation was given to the Forest Protection division of the Forest Service in the study of the factors affecting the inflammability of forest fuels.

Division of Markets and Exhibits.—The demand for sets of specimens of the principal commercial woods of Canada continues, and ninety-six sets were sent out during the year. Exhibits were prepared for the National Museum at Ottawa, for nineteen Canadian trade commissioners stationed at various points all over the world, for the Imperial Institute at London, England, and for the International Exhibition at Antwerp, Belgium. The laboratories also participated in exhibits at the Toronto Builders Exhibition and the Quebec Provincial Exhibition of Natural Resources, and had displays in the Royal York Hotel, Toronto, and the Buffalo and Detroit offices of the Department of Immigration and Colonization. A number of magazine articles were written and tests made by members of the staff relating to the work of the Laboratories.

VANCOUVER LABORATORY

Requests for technical information increased by ten per cent; several of these were important and led to special investigations.

Division of Timber Mechanics.—Tests to determine the effects of incising and creosoting on the strength of Douglas fir ties were completed and a report made. Work was continued on the testing of clear specimens of Western woods, the effect of variable moisture contents on the strength of wood, the deterioration of black cottonwood logs in fresh-water storage, and the retention of nails and screws in wood. A request was received from the Fisheries Experiment Station for further co-operation in the testing of glues made from fish waste. Many custom tests of various construction materials were also carried out.

Division of Timber Products.—An investigation of the absorption of moisture by timber shipped, respectively, by water and by rail was made co-operatively with the Ottawa Laboratory and the Forest Products Research Laboratory at Princes Risborough, England. These indicate that kiln-dried lumber shipped by rail will reach its destination in satisfactory condition, but such material will for some uses require re-conditioning on arrival in England. Air-seasoning studies on Engelmann spruce were made at mills in the Interior region. Efficient drying schedules were developed for the seasoning of Western red cedar, yellow cypress, and alder. Studies of the shrinkage of commercial sizes of cedar were made and as a result of a study of the "cupping" and loosened knots in Engelmann spruce definite recommendations were made to a co-operating mill with a view to improving their kiln practice. The effect on durability and serviceability of various temperatures in drying shingles was studied. Eighty-nine per cent of coast mills having dry kilns were included in a survey made to determine variation in moisture content of kiln-dried lumber at the time of shipment and the effect of moisture content on machining. A series of studies at four coast mills shows that considerable improvement has been made in kiln-drying practice since the first studies in 1925. Twenty-one students attended the third annual six-day kiln-drying course. A marked improvement in seasoning practice was reported by the British Columbia Lumber and Shingle Manufacturers' Association. Loosened grain in kiln-dried Douglas fir, "collapse" in kiln-dried shingles, and the effect of different methods of lumber-piling on the rate and uniformity of drying were continued, and a study made of the effect on the yield of seed of different combinations of temperature and humidity in extracting lodgepole pine seeds. Mill-waste studies have shown that 67 per cent of the volume of the log is recovered as lumber. Studies in log waste were also commenced. Studies of the effect of kiln-drying on the sterilization of lumber and the effect of purple stain on the properties of Douglas fir and Western red cedar were begun, and a study of the development of stain in overseas shipments was continued.

Several articles by laboratory officers were published in lumber and engineering journals, and twenty-five lectures on technical subjects were given to lumbermen's organizations and educational institutions.

In co-operation with the British Columbia Lumber and Shingle Manufacturers' Association, Limited, an exhibit of British Columbia forest products was prepared for the Antwerp Exhibition, and, in co-operation with the British Columbia Forest Service, material for an exhibit of British Columbia products was prepared for the Crystal Palace, London, England. Exhibits were also made at the Vancouver Exhibition (in co-operation with the Canadian Forestry Association), at the West Coast Lumbermen's Association at Tacoma, Washington, and in a number of other cases.

PULP AND PAPER LABORATORY (MONTREAL)

Very satisfactory progress has been made by the laboratories during the year in formulating a program of work, in obtaining competent personnel to engineer such a program, and in getting various projects well organized. The program of work and activities of the Laboratory are under the general adminis-

tration of a committee composed of representatives of the Forest Service and of the pulp and paper industry. The new program was developed in close cooperation with the industry through several committees of the Technical Section of the Pulp and Paper Association. Practically all the former projects were included, and a number of progress reports from these were included in Volume 2 of "Research Notes." A manual of pulp testing is being compiled for the use of laboratory workers. Investigative work is being done on the adaptation of alkaline pulps to the manufacture of artificial silk, as a result of which it now seems that it will be possible to produce alkaline pulps suitable in all ways for artificial silk production. The manufacture of sulphite pulp is being studied with special reference to the quality of pulp made from different species and by different processes, full tests being made of the products. Investigation is being made of the qualities of pulp as they affect the qualities of the paper made from it; this investigation consists largely of the development of new methods of testing and the substantiation of such methods. Chemical pulping depends on the action of certain reagents in dissolving the non-cellulose materials of the wood and the laboratory has undertaken a thorough study of the factors and conditions covering the penetration of cooking liquors into wood, for instance, the conditions which bring about the gradual weakening of the cooking liquor. In connection with the study of the whole question of bleaching, apparatus has been designed and constructed for the correct estimation of hydrogen-ion concentration in oxidizing solutions, and of the circulation of bleaching liquor through pulp. A systematic study of the ground-wood process is being undertaken under the headings: (1) Definition of ground-wood quality, (2) Definition of stone quality and stone surface, (3) Study of the factors of operation, (4) Study of machine design, auxiliary appliances, and related methods of procedure.

SILVICULTURAL RESEARCH

The first field-work in connection with the Canada-wide study of the rate of growth of forests in their various conditions was commenced this year. It is proposed to determine the average current rate of growth of each tree species in each age-class and in each timber type. Particular attention will be given to young timber, the potential forests. Four field parties of eight men each commenced work on this problem in May and continued until October. These parties were located in Nova Scotia, New Brunswick, Quebec, and Ontario. By the end of the fiscal year the data were compiled and summarized in preparation for the interim report.

An additional research party in Quebec was engaged in remeasuring the numerous permanent sample plots that have been established at the several stations—Lac Tremblant, Lake Edward, and Lake Kenogami—from time to time during the past ten years. The results of the first remeasurement, and, in some instances, of the second remeasurement are now available.

Dual activities, research and administration, were conducted at the Petawawa experiment station. Research was concentrated on remeasurement of sample plots in connection with several experimental cutting areas, and with surveying an area for a demonstration woodlot to be managed on a working-plan basis. Considerable advancement has been made in the development of a fire-weather station at Petawawa. The season being exceptionally dry, the collection of most interesting and valuable data was made possible. It was a busy season for the administrative staff. Over a dozen fires started, but prompt action and continuous fighting kept them under control so that loss of timber was very slight. The organization, from detection to suppression, was strong; otherwise much valuable timber and many investigative projects would have been destroyed.

Further progress has been made with the study of type classification based on the distribution and association of floristic species of ground cover. The information collected by a field party in Alberta during the summer of 1929 indicates that some four or five definite types or sites can be recognized by the grouping of certain characteristic floral species.

The bulletin, *Form-class Volume Tables*, now issued, presents in concise form information invaluable to those, from coast to coast, concerned with forest products.

PUBLICITY

As it was felt that the annual forest-week campaign which had been staged each spring for several years had outlived its usefulness, this method of fire prevention was discontinued in 1929. The newspaper-advertising campaign, previously an integral part of the forest-week campaign, was however, maintained as a separate venture and showed uniform success. Advertisements appeared under this plan in all dailies, weeklies, farm periodicals, and foreign-language and financial papers over the period from May to September.

In June, July, and August, four different lecturers were in the field, visiting boys' and girls' vacation camps. In all 32 camps and 3,013 campers were visited.

A representative of the Service again supervised the forestry exhibits at the Class A fairs in Western Canada. Following the success of the log cabins erected by this Service on the fair grounds at Calgary and Edmonton, similar structures were erected on the fair grounds at Saskatoon and Brandon; the latter is a particularly fine example of log building, and has come in for considerable commendation and admiration. In addition to these exhibits at Class A fairs, booths were established by local officers at twelve of the smaller fairs and exhibitions in the Prairie Provinces and British Columbia.

The course of forestry lectures at Dauphin normal school was carried on as usual. Routine publicity materials—calendars, posters, pamphlets, novelties for distribution at fairs, and similar items—were designed and distributed throughout the year. The district inspectors report a steadily increasing interest in forestry problems, stimulated by the publicity work of the Service.

PUBLICATIONS

The most important publication issued during the year was the book of *Form-class Volume Tables* for red, white, and black spruce; red, white, jack and lodgepole pine; and balsam fir. This embodies the results of several years' work by the Research division of the Service. These tables will prove of great service to foresters and executives of large lumbering and pulp companies in computing the quantities of wood to be obtained from different stands of timber, and a large demand has already been experienced for them. The format is designed to make the book of service in the field as well as in the office. The book includes 170 volume tables showing the volume of wood to be obtained from trees of specified diameters and heights, and a number of other tables of value to foresters and timber estimators. Two new circulars were issued, namely, No. 27, *Creosote Treatment of Douglas Fir*, and No. 28, *Stain and Decay in Lumber-seasoning Yards*. Forestry Topic No. 6, *The Christmas Tree Trade in Canada*, was also issued during the year.

REVENUE

The revenue from all sources during the fiscal year showed a net decrease of \$33,591.28. With the exception of the fiscal year 1926-7, the revenue was

less than that of any year in the five-year period 1924-5 to 1928-9 and about \$18,000 below the average. The decrease was due mainly to lessened receipts of \$24,170.44 in timber sales and \$10,298.51 in miscellaneous receipts.

The decrease in timber-sale revenue is due mainly to the drop in receipts from the Pasquia forest, Saskatchewan, which amounts to \$36,596.80. Although the number of active sales was greater than the previous year, "Supervisor's" sales predominated, and, while this class of sale evidently fills a long-felt want, the volume of timber thus sold was below that included in "District Office" or "Head Office" sales of previous years, as partly indicated by the decrease in revenue. A substantial increase in the revenue from timber sales in the Big River forest, Saskatchewan, somewhat offsets the net decrease in Saskatchewan. Active timber sales show an increase of 16, with "Supervisor's" sales predominating.

The revenues from fishing and nursery stock show slight increases and that from tree seed is increased by \$4,936.16. Grazing fell off somewhat in Alberta, but shows increases in the other provinces, leaving a net decrease of \$689.01. Owing to the continued dry weather the demand for hay was unusually heavy, resulting in an increase of \$1,009.17. The increased demand for summer-resort privileges is also indicated in the increase of \$1,005.95 in surface rentals.

The kinds and total quantities of timber authorized to be cut from all reserves, the revenue of which is shown under the heading of "Timber Permits" in the statement of revenue, were as follows:—

Fuel-wood (cords).....	25, 161
Fence posts, rails, and piling (number).....	338, 070
Fence posts, rails, and piling (linear feet).....	15, 060
Telephone poles (linear feet).....	1, 670
Railway ties (number).....	770, 201
Saw-timber (feet board measure).....	7, 568, 961
Mining timber (linear feet).....	498, 760
Mining ties (number).....	500
Building logs (number).....	21, 287
Building logs (linear feet).....	131, 723
Miscellaneous (cords).....	1, 666
Miscellaneous (number).....	215

Sixty-two new timber sales were awarded during the fiscal year. The dues payable amounted to \$99,050.26, and \$110,519.19 including arrears was collected.

The kinds and amounts of material cut and scaled on national forests in connection with timber sales are shown in the following statement:—

Number of active sales.....	166
Sawlogs (feet board measure).....	21, 804, 842
Mine timber—	
Lagging (linear feet).....	115, 627
Other kinds (linear feet).....	718, 016
Railway ties hewn (number).....	29, 014
Telephone poles (linear feet).....	887, 487
Fence-posts, rails, and droppers (number).....	18, 683
Fuel-wood (cords).....	1, 364½
Pulpwood (cords).....	1, 105
Boxwood (cords).....	3, 905
Piling (linear feet).....	24, 767
Mine props (feet board measure).....	477, 216
Mine ties (number).....	8, 395

STATEMENT OF REVENUE, FOREST SERVICE, FISCAL YEAR 1929-1930

National Forest	Number of timber sales operating	Revenue from timber sales		Revenue from permits, etc.		Revenue from grazing permits		Other Sources of Revenue						Total revenue all sources											
		\$	cts.	\$	cts.	\$	cts.	\$	cts.	Hay permits and seizures	Surface rentals	Special uses	Tree seed		Miscellaneous including fishing	Casual revenue	House rent	\$	cts.						
Duck Mountain	3	1,209	81	299	2,463	23	17	183	60	388	25	566	35	62	00	36	00	0	70	4,909	94				
Porcupine No. 1	4	441	18	89	1,453	37	1	2	00	29	00	27	00	164	00	164	00			2,116	55				
Riding Mountain	1	3,553	25	1,187	10,417	08	17	160	40	754	84	1,744	57	145	00	239	70			17,014	84				
Sandilands	3	1,901	19	13	203	20								4	00					2,108	39				
Spruce Woods				10	22	50				40	25									62	75				
Turtle Mountain				16	55	25	34	331	00	178	75	72	60	16	00	50	00		144	00	847	00			
Manitoba Total	11	7,105	43	1,614	14,614	63	60	677	00	1,391	09	2,383	52	254	00	489	70	0	70	144	00	27,060	07		
Beaver Hills				28	109	50	18	79	79	314	25			2	00							505	54		
Big River	2	12,260	99	76	388	32	2	31	52	163	75			28	50				288	00	13,170	08			
Dundurn				22	84	00	5	155	68	26	00			7	00							272	68		
Elbow				269	615	25	156	917	50	80	00	1	00	227	20							1,840	95		
Fort à la Corne	7	930	82	259	2,372	59	1	2	76	34	75	27	00	21	00							3,094	82		
Keppel				6	41	50	51	362	28					6	00							409	78		
Manito				79	252	50	94	1,549	48	41	50	115	30	47	00				18	53		2,024	31		
Moose Mountain	1	19	43	169	710	35	22	189	97	223	33	275	48	31	00	881	00		15	00	144	00	2,489	56	
Nisbet-Pines	8	981	66	242	1,347	05	20	284	47	212	25	5	00	869	88							3,700	31		
Pasquia	36	25,818	72	88	2,617	52	2	23	42	220	25	8	00	59	00							29,034	91		
Porcupine No. 2	13	2,778	61	293	1,979	61	6	70	78	433	25	140	00	206	00							5,608	25		
Seward							29	713	44	52	50			26	00							791	94		
Saskatchewan Total	67	42,805	23	1,531	19,518	19	406	4,381	09	1,801	83	571	78	1,530	58	881	00	33	53	930	00	63,453	23		
Athabaska				3	43	40	7	82	28	7	25			35	00	94	00					84	00	345	93
Bow River	2	4,925	95	43	539	28	67	4,264	02	17	00	1	25	51	25	22	00	32	81			9,853	57		
Brazeau	12	6,765	55	32	1,555	66	84	306	50			1,536	59	26	00	634	25			144	00	10,968	52		
Clearwater	4	9,140	28	12	290	88	39	303	56	4	75	573	78	14	19	298	62		30	80		10,656	86		
Cooking Lake				6	17	00	63	469	28	153	75			3	00							144	00	787	03
Crowsnest	7	2,216	15	131	5,042	41	140	5,995	26			339	06	306	25	137	00					14,036	13		
Cypress Hills	1			454	2,363	76	92	1,952	19			65	15	127	83	9	00					4,661	93		
Lesser Slave	6	9,419	50							6	50			10	00	39	75					144	00	9,619	75
Alberta Total	32	32,467	44	681	9,852	39	492	13,373	09	189	25	2,515	80	573	52	1,234	62	63	61	660	00	60,929	72		
British Columbia Reserves	54	22,684	71	23	239	28	91	1,606	10	41	25	297	80	201	67	13,310	60			190	61	95	23	38,658	25
Indian Head Nursery																5,014	95			34	00	1,200	00	6,248	95
Forest Products Laboratories																67	80							67	80
Sundries																12	00							2,006	05
Head Office (Petawawa)	2	5,456	38	4	265	00																		5,721	38
Grand Total	166	110,519	19	3,853	35,480	49	1,058	20,037	28	3,423	42	5,768	90	2,559	77	13,322	60	8,452	73	1,647	07	2,934	00	204,145	45
Refunds					7,816	73		1,227	17	115	50					18	00							9,177	40
Net revenue		102,702	46	3,853	34,253	32	1,058	20,037	28	3,307	92	5,768	90	2,559	77	13,322	60	8,434	73	1,647	07	2,934	00	194,968	05

IV

NATIONAL PARKS OF CANADA

REPORT OF THE COMMISSIONER, J. B. HARKIN

National Parks

GENERAL

The year 1929-30 was one of activity and expansion in the work of the National Parks of Canada. Two new areas were investigated and added to the national parks system. The first of these included twenty-nine island reservations in the Georgian Bay district of Ontario. Some years ago officers of the National Parks Branch had pointed out the rapidity with which this beautiful region was being taken up by summer residents, with the result that there would soon be no places to which the general public could have free access for camping, bathing, or picnicking. An examination of unalienated islands, title to which still remained in the hands of the Department of Indian Affairs in trusteeship for the Ojibway tribe, was made by National Parks officers. Later by arrangement with the Department of Indian Affairs, a number of suitable islands were reserved, and last year twenty-nine were acquired and set aside as the Georgian Bay Islands park. Beausoleil island, the largest of the group—in fact the only remaining large island not taken up in the entire region—is well suited to become a public resort. It covers nearly five square miles and presents a good example of the characteristic scenery of this picturesque part of Ontario. Beautiful groves and bathing beaches of white sand make it attractive for outdoor recreation while its plant and bird life are varied and interesting.

Beausoleil island, too, played a part in that tragic drama which resulted in the annihilation of the great Huron Confederation at the hands of the Iroquois. After their crushing defeat at Fort Ste. Marie II, a few Hurons, Jesuit clergy, and French soldiers are said to have taken refuge from their persecutors on this island. Ruins of fireplaces and piles of debris which appear to indicate a line of fortifications laid out on military principles are still to be seen and lend support to the belief. Others believe that the ruins are of Ojibway origin, and date back to a period one hundred years later than the downfall of the Hurons when the Ojibways came down from the north and occupied the island. The word "Beausoleil" is a French translation of the Indian name "Chi-kon-de-kiara," meaning "land-seen-in-the-beautiful-light-of-distance," or more freely "land-of-the-beautiful-sun." This charming designation may have owed its origin to the wonderful sunrises and sunsets for which Georgian bay is famous.

Another new park region of interest is that recently set aside covering the Riding mountain in Manitoba. It consists of 1,148.04 square miles of rolling woodland country dotted with beautiful lakes, of which Clear lake, already a resort, is the best known. The new park extends somewhat over fifty miles from east to west, and from twelve to twenty-four miles from north to south. It lies southwest of lake Dauphin and approximately 120 miles north of the international boundary. The eastern portion is broken, hilly country, forming part of the well-known Riding Mountain escarpment. The terrain is cut by deep gorges and covered with dense poplar, spruce and jack-pine forests which will provide opportunities for forest research and nature study in addition to the recreational attractions. On the east and north the escarpment rises abruptly

from the plains. To the south and west the terrain extends in a wide plateau broken by rolling hills. The park is also a natural home for big game and contains one of the largest herds of wild elk on the continent. Moose, deer, bear, and smaller animals are found in numbers, while its ponds and lakes supply a resting and feeding place for thousands of wild birds. Surveys for the construction of a highway to Clear lake were undertaken last autumn and development work will be prosecuted as soon as the season opens.

TRAVEL TO THE PARKS

The present year marks the eighteenth since the creation of the National Parks Branch. In that time astonishing developments have taken place. The number of national parks has been increased from seven to eighteen and the total area from 4,019.5 square miles to over 12,000 square miles. In every part of the Dominion the importance of national parks is appreciated and there is apparent a growing pride in these great national possessions. This interest has been reflected in the rapid growth of travel to the parks, which are no longer regions visited by the wealthy few, but are attracting the multitude.

VISITORS TO NATIONAL PARKS

The number of visitors entering the national parks last year was the largest yet recorded. The total reached 559,329, as compared with 488,721 in the previous year. Totals by parks for the two years show decreases and increases as follows:—

Park	1929-30	1928-29
Banff.....	217,781	236,801
Buffalo.....	18,853	18,454
Elk Island.....	22,611	18,968
Fort Anne.....	18,000	16,000
Glacier.....	1,000	1,000
Jasper.....	15,458	14,000
Kootenay.....	51,772	33,238
Nemiskam.....	100	50
Point Pelee.....	83,200	50,100
Prince Albert.....	10,131	5,118
Revelstoke.....	8,000	8,800
St. Lawrence Islands.....	20,000	18,000
Vidal's Point.....	17,400	15,050
Waterton Lakes.....	48,592	26,002
Yoho.....	26,431	27,140
	559,329	488,721

Increase 70,608.

It will be noted that the largest increase occurred in the smaller parks, Waterton Lakes park showing a growth of nearly 90 per cent. Prince Albert park practically doubled the total of the previous year, while Kootenay park also showed a big increase. The business depression undoubtedly affected long-distance travel to Banff, particularly during the latter part of the summer, a decrease which was, however, partly made up by the increase in motor travel. The total number of cars using the Banff-Windermere and Kicking Horse highways was 98,482, an increase of 5,604 over the previous year. This increase is very gratifying and shows that these roads are fulfilling the purpose for which they were constructed—to act as through routes across the Rockies between the prairies and the coast, and as a means of bringing in foreign tourists to Canada.

REVISION OF PARK BOUNDARIES

The decision to transfer the natural resources to the western provinces led to a revision of the boundaries of the parks on the eastern slope of the Rockies. While the boundaries of these parks have been extended from time to time in the past, such extensions have always been considered as provisional. With the passing of all Crown lands, with the exception of national parks, to the provinces the desirability of fixing permanent boundaries became obvious.

During 1927 Mr. R. W. Cautley, D.L.S., was accordingly instructed by the minister to investigate the eastern areas of Banff and Jasper national parks and make recommendations for the guidance of the Government. Associated with Mr. Cautley was Mr. L. C. Charlesworth, Chairman of the Irrigation Council of Alberta, who was appointed the official representative of that province.

The report submitted strongly recommended, for the facilitation of both forest and game protection, that heights of lands as opposed to streams should be taken as boundaries. It pointed out that the valleys form the natural routes of travel both for game and visitors and that to have a closed area on one side of a stream and an open one on the other would lead to confusion and annoyance as well as danger to park game. The exclusion of certain areas possessing natural resources was recommended, including the Kananaskis and Spray watershed areas, the Ghost River area, the Red River watershed, the northerly portion of Rocky Mountains park, and the Brulé and Rock Lake areas which are believed to contain extensive coal deposits. With the exclusion of the areas recommended in the report, Rocky Mountains, or Banff, national park will be reduced in area from 3,961.50 square miles to 2,585 square miles, and Jasper national park from 4,635 square miles to 4,200 square miles.

PRESERVATION OF WILD LIFE

It is now eighteen years since the national parks were made game sanctuaries, through the establishment of an adequate system of game patrols and enforcement of the regulations. The results attained have been most gratifying. Native species have re-established their numbers to such an extent that the parks are more and more becoming the wild life reservoirs of the country.

Restocking.—In the past two or three years provincial governments have been drawing on the parks to replenish depleted game areas in other parts of the country. Two regions in the southern part of British Columbia have been stocked with Rocky Mountain sheep and an additional area between the Okanagan and Kettle valleys with elk. During the past year the British Columbia Government took up with the Department of the Interior the question of restocking the Queen Charlotte islands with elk. Authority was granted to furnish them with a small herd from the Buffalo park at Wainwright. The animals were cut out of the main herd—which now numbers 600—early in the spring, corralled until safe to handle, and then placed in specially constructed crates. Through the co-operation of the Canadian National Railways a special baggage car was provided which was attached to the regular passenger train for Prince Rupert and went through express to that port. Here the elk were transferred to a boat sailing to the Queen Charlotte islands. No loss or injury was sustained in transit and according to report the animals are settling down and adapting themselves successfully to their new surroundings.

Scientific and Educational Shipments.—Shipments for scientific and educational purposes were also made to various parts of the world. Two female buffalo were shipped to the Zoological Gardens of the city of Johannesburg, South Africa, and arrived in good condition after their long journey. A pair of beaver and a buffalo cow were presented to the Royal Zoological Society of Antwerp, Belgium. One male and two female buffalo were forwarded to the

Zoological Society of the city of Adelaide, Australia; two male buffalo and a pair of beaver to the Zoological Gardens at Auckland, New Zealand; and a pair of Rocky Mountain sheep to the Zoological Gardens, London, England. The Division of Animal Husbandry, United States Department of Agriculture, at Matanuska, Alaska, applied for one male and three female yak for experimental purposes in connection with the experimental farm there, and these animals were shipped in the autumn. A Rocky Mountain ram was presented to the Edmonton Exhibition Association, and one pair of sheep and a male elk to the city park authorities of Fort William, Ont. Two female buffalo and a pair of elk from Buffalo park were also donated to Stanley park, Vancouver, B.C. The male elk died shortly after arrival and an additional male was accordingly sent. A pair of Rocky Mountain goat was forwarded to the Zoological Gardens, Victoria, B.C. The corralling and shipping of such large wild animals, as most of the above, involves a good many difficulties, but it is gratifying to know that nearly all the animals reached their destination in good condition and are reported to be doing well.

Government Buffalo Herds.—The Government buffalo herds are in a very thriving condition. Nearly all problems in connection with their maintenance have been successfully met; the chief difficulty now is to keep their numbers within the forage limits of the reserve. The rapidity of increase is shown by the fact that if no disposal had been made of surplus animals since the original purchase in 1909, the herd through natural increase alone, would now total about 20,000 head. The calf crop at Buffalo park last year numbered about 1,200, with an approximately equal number of males and females.

The wisdom of the department's action in reducing the numbers in Buffalo park and of increasing the range at Elk Island park was particularly evident last year. The season proved to be very dry and the forage consequently scanty and poor, yet, owing to the fact that there was no overcrowding, the herds reached the autumn in good condition. Except for a severe spell in December, the winter was favourable, with moderate temperatures and snowfall and the animals came through well. A census taken in March showed 5,016 buffalo in Buffalo park and 716 in Elk Island park. No new shipments were made to the Far North during the year. In the autumn, with a view to keeping the herd in Buffalo park near the 5,000 total, a slaughter of 500 animals was decided upon. This was carried out early in December when the fur was prime. Owing largely to the educational and publicity efforts carried on by the department there now exists a ready market for buffalo products and no difficulty was found in disposing of the meat and hides, both at an advanced price compared with the previous year. Investigations were made with a view to improving forage conditions in Buffalo park and, at the request of the parks authorities, an official of the federal Department of Agriculture spent some time at Buffalo park, examining soil conditions and the present herbage. Steps are being taken to put the recommendations contained in his report into effect.

Antelope Herd.—The antelope herd at Nemiskam park is thriving. Climatic conditions during the past year were very favourable, particularly the mild winter with its light snowfall. There was an abundance of grass in the park, the antelope came through the cold season in good condition with no loss, and the natural increase in the spring was very satisfactory. The herd in Nemiskam park now totals 300. The chief enemy of the antelope is the coyote but, as in other parks, this pest was less troublesome this year, apparently owing to some epidemic which decreased the number. In co-operation with the Department of Agriculture an investigation was made with a view to determining the importance of sage brush in the feed of antelope and of discovering methods of increasing the growth of the plant in Nemiskam park.

Beaver.—Questionnaires were sent out to the game warden staffs in Banff, Jasper, Waterton Lakes, and Elk Island national parks, to obtain a census of the present number of beaver in each park; also suggestions as to their control where desirable and propagation in selected areas. Beaver had increased to such an extent in Cabin lake, Jasper park, that they were causing trouble with the water supply system there. The superintendent was authorized to trap a number of these alive and to place them in other waters of the park. Beaver were also found to be damaging the fish hatchery at Waterton Lakes park and authority was given the superintendent there to capture twenty-five animals alive for transfer elsewhere in the park.

FIRE PROTECTION

Owing to the extreme dryness of the season a number of fires occurred in the parks. The vigilance of the wardens, however, and the use of up-to-date fire-fighting equipment reduced the fire damage to the minimum. There are now in the parks 150 portable pumps with 200,000 feet of 1½-inch hose; several self-propelled pumpers with hose trucks similar to those used in cities, for use on highways; trailer pumpers of 20 horse-power; and automobile front-end pumps. Each year the equipment is being added to and the manner in which fires are now brought under control shows the efficiency of the provision made to safeguard the great park areas from fire.

The numbers of fires, the areas burned over, and the cost of extinguishing is shown by the following tables:—

RAILWAY FIRES DURING 1929-30

Park	Number of fires	Area burned	Cost of extinguishing
		acres	\$ cts.
Jasper.....	3	9½	176 62
Banff.....	12	10½	139 76
Yoho.....	6	4½	25 01
Totals.....	21	25	341 39

GENERAL FIRES DURING 1929-30

Jasper.....	16	42½	450 95
Banff.....	33	3,476½	17,297 68
Yoho.....	3	1,500½	3,218 46
Glacier.....	2	5	246 80
Buffalo.....	1	2½	10 00
Elk Island.....	3	1½	2 50
Kootenay.....	9	100	1,796 13
Mount Revelstoke.....	5	116	1,932 37
Point Pelee.....	2	4½	.....
Prince Albert.....	6	10,650½	1,489 70
Waterton Lakes.....	6	.....	67 75
Totals.....	86	15,898½	26,512 34
Grand totals all fires.....	107	15,923½	26,853 73

THE BIG BEND HIGHWAY

Following negotiations between the federal Government and the Government of British Columbia, arrangements were made for the construction

of the Big Bend highway which will connect Revelstoke with Golden and form the last link in the western section of a trans-Canada motor route. The road, which is now under construction, when completed, will provide a direct way through all-Canadian territory from Winnipeg to Vancouver and furnish an artery of communication which from a tourist point of view should prove of inestimable economic value to the country. Two years ago the Dominion Government constructed a link in the highway from Lake Louise in Banff national park through the Kicking Horse pass via Yoho park to connect with the provincial road through the Kicking Horse canyon from Golden, B.C. About the same time the province of British Columbia completed the scenic highway up the Fraser valley and as far as Revelstoke, B.C. There remained only the barrier of the Selkirk range to be surmounted, but this involved many engineering difficulties. Under the agreement made by the Government of Canada with the province of British Columbia the eastern section of the Big Bend highway from Donald to Boat Encampment at the head of the Big Bend will be constructed by the Dominion, while the western section from Boat Encampment to Revelstoke will be built by the province of British Columbia.

The Big Bend route will afford a spectacular scenic motor trip. The highway from Calgary to Vancouver, will pass through mountain scenery of unsurpassed grandeur and sublimity. Lofty mountains, deep luxuriant valleys, snowfields, and glaciers with many charms truly alpine in character, will be unfolded to the tourist. By the completion of this link the people of the Prairie Provinces will have ready access to the sea-level climate of the coast, while Banff and the beautiful Lake Louise district will be brought within easy reach of the people of the Pacific coast.

Over 500 miles of motor highways, more than 2,000 miles of trail and nearly 900 miles of telephone lines were under maintenance last year. The mileage by parks is as follows:—

Park	Roads	Number of miles	
		Trails	Telephone lines
Banff.....	145	769.0	235.25
Jasper.....	108	647.50	308.25
Yoho.....	55	168.25	44.25
Glacier.....	9	121.0	7.0
Waterton Lakes.....	34	225.25	57.37
Kootenay.....	71	115.50	64.00
Mount Revelstoke.....	19	34.25	17.25
Buffalo.....	11	.....	34.50
Prince Albert.....	34	7.0	89.0
Elk Island.....	15	.....	.....
Point Pelee.....	7	.....	.....
	508	2,087.75	856.87

LANDSCAPE AND ARCHITECTURAL WORK

The plans of a large number of buildings proposed to be erected in the various national parks were examined and in the majority of cases drawings showing suggested revisions to elevations were prepared with a view to improving the external appearance without adding to the cost of buildings. These included designs for residences, stores, hotels, theatres, banks, churches, hospital, service stations, masonic lodge, tea rooms, public garages, and other structures.

Working and detail drawings and specifications were prepared for the following new Government-owned buildings.

Gateway building, eastern entrance to Banff park.

Milk vendor's store at Tunnel Mountain auto campsite, Banff park.

Addition to dressing room accommodation at Cave and Basin swimming pool, Banff park.

Residence for superintendent, Kootenay park.

Stores and garage building, Yoho park.

Residence for superintendent, Yoho park.

Gasolene and oil storage building, Yoho park.

Addition to Government garage, Waterton Lakes park.

Addition to Administration building, Waterton Lakes park.

Administration building, Prince Albert park.

Caretaker's office, auto camp grounds, Prince Albert park.

New Royal Canadian Mounted Police quarters, Prince Albert park.

Alterations to foreman's cottage, Buffalo park.

Refreshment pavilion, Point Pelee park.

Pavilion, Beau Rivage island, St. Lawrence Islands park.

Plan of War Memorial park at Mattawa, Ont.

A number of plans for new subdivisions and automobile camp grounds in Prince Albert park, where new roads are opening up attractive building areas, were prepared, also plans of proposed zoning areas in the townsite of Banff. Designs were drawn as well in furtherance of landscape development at the Great Divide near Stephen, B.C.

PUBLICITY

The Publicity Division was very active during the year. A systematic course of lectures illustrated by moving pictures and coloured lantern slides was given in Canada and the United States. Attractive publications were issued, moving pictures loaned, and articles and memoranda furnished to writers, magazines, and newspapers. The number of lectures delivered during the year was 140. Moving pictures shown outside the office, 718; within the office, 1,788; loaned, 355. The photographic library was increased by several hundred negatives; 23,975 new prints were added to the collection; and 16,481 distributed. Enlarged pictures sent out numbered 1,162; coloured slides added to the collection, 3,456; loaned, 4,710. Eighty-five lectures were prepared and provided for outside lecturers and 437 articles with 291 cuts furnished papers and magazines. Framed pictures used for exhibition purposes numbered 340.

To meet the increasing demand for publications, 344,380 pamphlets (new editions and reprints) were printed. These included:—

First editions—*Jasper*, 10,000; *Banff, Kootenay and Yoho Parks*, 25,400; *Guide to Waterton Lakes Park*, 25,000; *Elk Island Park*, 25,000; *Geological Story of Jasper National Park*, 10,000; *Guide to Fort Wellington*, 10,000; *The Succession of Fossil Faunas in the Eastern Part of Jasper Park*, 1,000; *Sedimentation in a Glacial Lake*, 1,000.

Reprints—*Banff, Kootenay and Yoho Parks*, 51,250; *Rocky Mountains Circle Tour*, 50,000; *Waterton Lakes Park*, 35,815; *The Kicking Horse Trail*, 25,100; *Kootenay National Park and the Banff-Windermere Highway*, 25,300; *Guide to Fort Anne*, 25,450; *Through the Heart of the Rockies and Selkirks*, 10,065; *Prince Albert National Park*, 10,000; *Tourists' Guide of Canada-1929*, 1,000.

During the year 209,095 pamphlets were distributed, besides 2,500 copies of the Annual Report of the Commissioner of National Parks, 1927-28.

REVENUE

Revenue collected by the National Parks of Canada during the fiscal year ended March 31, 1930, amounted to \$251,007.78. The following statement shows the revenue by parks:—

	1929-30		1928-29	
	\$	cts.	\$	cts.
Banff National Park.....	148,851	63	150,963	10
Buffalo Park.....	26,430	39	23,561	61
Elk Island Park.....	9,343	50	5,993	15
Glacier Park.....	142	23	166	14
Jasper Park.....	35,252	72	29,994	39
Kootenay Park.....	14,431	51	13,729	64
Nemiskam Park.....	384	00	384	00
Point Pelee Park.....	401	75	607	37
Prince Albert Park.....	594	73	379	77
Vidal's Point Park.....	171	00	72	00
Waterton Lakes Park.....	6,926	42	5,622	08
Yoho Park.....	3,760	00	3,223	17
Fort Anne Historic Park.....	1	00	6	00
Breton Lake Recreational Area.....	10	00	10	00
Hawke Lake Recreational Area.....	10	00		
Lake Florence Recreational Area.....	66	00	60	00
Fines and forfeitures.....	2,876	59	2,590	93
Historic sites.....	30	00	32	00
Migratory Birds.....	70	15	74	00
Miscellaneous.....	1,254	16	1	00
	251,007	78	237,470	35

Detailed reports of the work in the different parks are found hereunder.

SCENIC PARKS

BANFF NATIONAL PARK

Reports show that Banff national park had a very successful year. Tourist travel by motor assumed greater proportions than ever before. The total number of cars, east-bound and west-bound, through the Kananaskis gateway was 74,246, an increase of 6,410 cars over the previous year's figures. Passengers numbered 142,337, or 21,439 more than in 1928. Of the grand total of visitors by motor 135,577 were from Canada and 6,760 from the United States.

Tunnel Mountain motor campsite showed increasing popularity. During the season 7,309 cars and 26,861 persons were accommodated on the grounds, establishing a record. Of the campers 24,139 were from Canada and 2,722 from the United States. The record for a single day was made on June 30, 1929, when 768 cars and 3,141 persons were in camp, as compared with 685 cars and 2,940 motorists on July 15, 1928.

As usual the Government hot springs proved popular with bathers. At the Cave and Basin bathing house registrations showed 66,305. New daily and week-end records were established. On July 1, 2,295 bathers passed through the turnstile, and during the week-end June 29-July 1, 4,731 bathers were accommodated. The number of visitors to the Cave adjacent to the hot springs was 61,010. At the Upper hot springs there were 46,146 registrations.

Museum, Zoo, and Animal Paddocks.—An outstanding place of interest to visitors is the Banff museum. During the year over 20,000 people viewed the collections of big game and smaller animals; bird, fish, and plant life of the region; geological specimens and Indian relics. The Banff zoo was again the centre of interest for thousands of tourists. The animals and birds now being

cared for at the zoo include: 1 polar bear, 2 grizzly bears, 1 black bear, 1 cinnamon bear, 1 mountain lion, 1 Canada lynx, 1 bobcat, 4 timber wolves, 4 coyotes, 1 badger, 2 martens, 1 gopher, 3 porcupines, 1 ermine, 2 great horned owls, 1 peacock, 2 golden eagles, and 4 Canada geese. The exhibition herds of animals at the paddocks were in splendid condition. These comprised 22 buffalos, 25 elks, 7 Angora goats, 10 Rocky Mountain sheep, 9 four-horned sheep, 7 Rocky Mountain goats and 5 yaks.

Permits and Licences.—Permits and licences covering the various business activities carried on in the park totalled 20,560. Of these 18,203 were motor licences for transients. Motor licences for park residents numbered 625; guides' licences, 58; chauffeurs' licences, 515; restaurant and tea room licences, 41.

Banff Fire Protection.—There were few fires during the tourist season, and what outbreaks occurred were quickly brought under control and caused no serious damage. During the year the Banff volunteer fire brigade responded to nineteen alarms. The total loss amounted to \$723. The brigade now numbers 25, officers and firemen. A night patrol was maintained in the townsite by the local detachment of the Royal Canadian Mounted Police.

Mosquito Control.—The campaign against mosquitoes in the park has shown gratifying results. After a thorough investigation of conditions some years ago, officers of the Department of Agriculture found that the most important species of mosquito to combat in the neighbourhood of Banff was the *aedes*, members of which breed in flooded areas. When hatched out the adults may travel as far as four or five miles. Experiments have shown that the eggs retain their fertility as long as six years. During the larva and pupa stages the insects must breathe through the surface of the water and a thin film of oil will cause their death from suffocation in a maximum time of four hours. During May, June, and July of 1929, ten men were employed in the distribution of oil over the areas affected. A total of 2,565 gallons of oil was used on an area of 4,500 acres. Satisfaction was expressed by the officials in charge of the work that the fish *Gambusia affinis*, an enemy of the mosquito, which had been deposited some years ago in the pool above the Cave and Basin, had been prolific in their increase.

Roads.—The roads in and about Banff and throughout the park were maintained in excellent condition during the season.

Trails.—A new trail was constructed from Castle Mountain bungalow camp to Taylor lake, a distance of three miles.

Cabins.—A new cabin (No. 2 type) was constructed at each of the following points: On Bow Lakes trail, 10 miles from Lake Louise; at Bow pass; at Waterfowl lakes; on the Saskatchewan river near the mouth of Howse river. A storehouse was also erected near the mouth of Howse river.

Forest Telephone Lines.—New telephone lines were constructed from a point seven miles up the Spray river to Seventeen-mile camp, and from Lake Louise to Bow pass.

Public Health.—Little sickness was reported in Banff during the past year. Sanitary measures relating to the collection of garbage were strictly observed. Samples of milk and water were periodically submitted for analysis to the University of Alberta, Edmonton, and the returns in every case proved satisfactory. During the period from October 31 to November 5, the annual test of the dairy herds was made by Dominion Government inspectors and all the animals found to be free from tuberculosis.

Sports.—Banff is becoming more and more a centre for athletic events of all kinds. During the summer mountain-climbing, boating, swimming, and golf drew thousands to the park. The annual Indian Days' pageant and sports were carried out on July 23, 24, and 25, and were largely attended.

During Christmas week the Mount Norquay Ski Club started its activities, which subsequently gave much enjoyment to the members and winter tourists.

The winter carnival held under the auspices of the Banff Winter Sports Association was most successful. From February 1 to 8 great crowds attended the sports. There were racing, swimming and diving events, hockey matches, sleighing, ski-ing, toboggan races, dog races, ladies' hockey matches, trap shooting, ski-joring, and carnival dances. The last day was mainly devoted to a curling bonspiel and other ice events.

JASPER NATIONAL PARK

Jasper park is rapidly increasing in popularity. Last season the total number of visitors was 15,458, as compared with 14,000 the previous year. A large number of the visitors were accommodated at Jasper Park Lodge, which has been enlarged to care for 600 guests. The golf links were greatly improved by the removal of boulders from the fairways, the addition and adjustment of bunkers, and extensive fertilization. In August the Canadian Amateur Golf tournament took place, and early in September was held the usual Jasper Park Lodge Totem Pole tournament.

During the season many improvements were made in Jasper townsite to meet the needs of a rapidly growing population. A considerable amount of new sidewalk construction was completed, the electric and water services extended, and the work of installing the sewerage system continued.

New Buildings.—Building operations in Jasper included 15 residences, 1 new hospital, 1 store and a number of garages and small buildings. In addition the Canadian National Railways took out permits for extensions, including 1 golfers' sleeping quarters, 1 sixteen-room cottage, 2 ten-room cottages, 1 two-suite cabin, 2 sixteen-room cabins, 1 nurses' building, 1 four-suite cabin, 1 garage, altering 6 cabins, and extending steam lines, water lines, electric light and telephone services. The estimated cost of all above extensions and improvements undertaken was \$441,845.

Roads and Bridges.—The portion of the Maligne highway from the railway crossing to Jasper Park Lodge, which had been surfaced with McMurray tar sands, stood up well under the traffic, and was maintained in excellent condition. The rest of the road was gravelled where necessary.

At the new Miette River bridge the approaches were filled with 2,262 cubic yards of material and strengthened at the highest points by strong log cribs. On the Edith Cavell highway a considerable amount of widening was done on the upper sections. The road was in good condition during the season and only a small amount of gravelling was required. The tote road from the Astoria bridge on the highway to the Whirlpool River bridge, eight miles in length, was completed. Along the river flats where boulders protruded, a covering of heavy silt was laid, which packed down and made a smooth running surface. On the Medicine Lake tote road culverts were put in at low points and considerable gravelling done. This road is being used increasingly each year by cars from Jasper in connection with trips to the wonderful Maligne Lake district.

The Rocky River trail was continued from mile 18½ to mile 36. Standard construction was maintained, making a good path for the pack train. When completed this trail will join the standard trail at Southesk river and the Forestry trail. There are now 379 miles of standard trails in Jasper park and

268 miles of "pack" or second-class trails. Fifteen miles of new telephone line were constructed during the year from Jacques lake to and up Rocky river. Forest telephone lines within the park now total 308 miles. New buildings included a warden's cabin of improved design at the forks of Rocky river.

Sanitation.—The drainage system was extended and new sewers installed and the usual routine of garbage collection and other sanitary measures continued.

Horses.—There are now ninety draft, saddle, and pack horses in the Government service in Jasper park.

Fires.—During the season there were three railway fires, two of which were caused by sparks from locomotives. The areas burnt over total nine and one-half acres and the cost of extinguishing was \$176.62. There were also sixteen fires of a general nature in the park which were extinguished at a cost of \$450, and one town fire which caused a loss of \$300.

Wild Life.—There has been a noticeable increase in all species of wild life in Jasper park. Grazing and food conditions generally were everywhere good and the animals appear well nourished and healthy.

Elk are becoming quite numerous and are finding new feeding grounds all over the park. The largest herds range between Pyramid mountain and Cabin creek, and many frequent the Athabaska and Miette valleys. The number of elk in the park is placed between 3,000 and 4,000.

There was a large increase in Rocky Mountain sheep during the year. All the old ranges, including Pocahontas, Interlaken, Brazeau, Snake Indian river, Moose Horn creek, Southesk river, and the northern boundary of the park, were well stocked. The sheep are now spreading wherever they can find suitable ranges. A large flock has been seen regularly at Cavell bridge on the motor highway, and has been a great attraction to tourists. A fine herd may also be seen daily on the Maligne range. It is estimated that there are now 20,000 sheep in the park.

Rocky Mountain goat are multiplying rapidly and are in good condition. Large herds may be seen about mount Kerkeslin, the shale banks on the Snake Indian river, Smoky river, Colin range, and Maligne lake. They are also found to be in increasing numbers between Circus valley and Whistler mountain, where they keep to high altitudes. The supervising game warden places their number at between 9,000 and 10,000.

Black bear, cinnamon bear, and grizzly bear are becoming numerous. Grizzlies have been seen during the spring and early summer in the low valleys, especially the Athabaska valley, around Devona and Hawse. They are also found in numbers in the Moose Horn valley. Last year there were estimated to be 5,000 bear of all kinds in the park.

Moose range in practically every valley and are becoming very plentiful. These animals have been seen in large numbers about the Brazeau, Rocky, and Snake Indian rivers, and last fall twenty-eight splendid specimens were seen at Four Point camp near Nigél pass. There are at least 10,000 moose in the park.

The season was particularly good for deer which now inhabit practically every valley in the park. They have shown a marked increase and are in fine condition. The Athabaska and Brazeau valleys are favourite feeding grounds for these graceful animals which now number in the park approximately 25,000.

Caribou are steadily increasing in number. Their range is along the northern boundary about Byng pass and Twin Tree lake, the Tonquin and Circus valleys and Smoky river. There are at least 9,000 caribou in the park.

Beaver, marten, lynx, and coyote are on the increase. New beaver houses and dams were noticed on several creeks and many lakes abandoned by these animals years ago are again being occupied by them. Wolf and wolverine are not so numerous as in previous years.

Sports.—Fishing was particularly good during the season. Fine catches were made at Caledonia lake, Jacques lake, at Buffalo prairie and in the Brazeau river. The 250,000 speckled trout fry deposited in Maligne lake last June appear to be doing well. A shipment of 50,000 rainbow trout eggs hatched at Jasper during the summer was distributed in Cabin lake.

During the winter a party of skiers from Jasper made the first ski trip on record to Banff. The journey took fifteen days to accomplish and was made during bitterly cold weather. Three high mountain passes had to be crossed and 160 miles of unbroken trail followed. Food supplies had been cached several months in advance at locations which would be accessible under skiing conditions and free from the depredations of wild animals. It was a noteworthy achievement.

In the month of March a party of skiers from Minneapolis visited Jasper park. Under the leadership of an experienced guide, the party proceeded through the Maligne Lake district, over McLeod pass, down to Brazeau lake, thence up Brazeau river and over Nigel pass to camp Parker, returning to Jasper via Brazeau lake, Poboktan pass and Maligne lake. The members of the party were so impressed with the trip they expressed an intention of returning next winter.

WATERTON LAKES NATIONAL PARK

Improved facilities for taking care of tourists and good weather conditions combined to give Waterton Lakes park its most successful year. The total number of registered visitors was 48,592, as compared with 26,002 the previous season. Of these 36,838 were from Canada, 11,673 from the United States, 62 from transatlantic, and 19 from transpacific points. The total number of motor cars entering the park was 14,725.

Many improvements were made in the townsite by planting trees, laying out flower beds, and grading, gravelling, and oiling the streets. Building operations were started on eight new buildings, and a fine addition was made to the school-house. Construction work on the new Roman Catholic church was well advanced.

Sports.—The facilities for sport were extended and the golf links, tennis courts, and bathing beaches were thronged during the season. At the golf course a new club-house was completed. The fairways and greens were in good condition, and accommodated over 60 per cent more players than last season. The tennis courts at the recreation grounds were maintained in excellent condition, and the bathing beach at Linnet lake was improved. Owing to the increased number of campers at Waterton lakes the campsite was extended, new sites provided, three new shelters erected, and an addition made to the community house.

Roads and Bridges.—Work on the Akamina highway progressed, and the road is now in good condition from the townsite to the junction with Cameron Lake road. The Pass Creek road was graded as far as the upper bridge and in places relocated. Beyond this point to Red Box canyon the road where necessary was gravelled. On the Pincher Creek entrance road the work was mainly confined to straightening the "S" bend. At Waterton bridge the approaches were improved and the bridge itself strengthened.

During the tourist season the roads leading into Waterton Lakes park were in good condition. The road from Cardston to the park, which connects with the

motor highway leading into the United States, was kept in repair by the provincial authorities and also the road from Cardston to Macleod. The park was thus connected with roads to the south and with a good gravel highway as far north as Edmonton.

Trails.—All trails were kept in a good state of repair. Six miles of construction work was carried out on Carthew trail, which is now passable from Cameron falls to Cameron lake. This scenic way when completed should prove one of the most popular in the park. Work was also done on the Bertha Lake Shore, Pass Creek, and East Boundary trails.

Fires.—Seven fires were reported during the season but by prompt measures these were quickly controlled, and the damage done was negligible. At Cameron lake where the largest of these fires occurred a new cabin was built and furnished with fire-fighting equipment.

Sanitation.—An officer of the Department of National Health made an inspection of sanitary conditions and arrangements were made to ensure satisfactory water supply and sewage disposal. An incinerator was built and better facilities provided for the disposal of refuse.

Wild Life.—Wild life of many kinds appears to be on the increase. Mule deer, beaver, coyote, and rabbit are plentiful throughout the park, while elk, mountain sheep, and mountain goat are steadily increasing in numbers. White-tail deer, moose, wolf, marten, lynx, and fox are scarce, and bear show a noticeable decrease. Of particular interest is the great increase in beaver. There are now over 1,500 of these animals in the park.

YOHO NATIONAL PARK

Motor travel to Yoho national park totalled 8,117 cars carrying 26,431 persons. The season was a particularly dry one, and due to the absence of fires and the general good condition of roads and trails, ideal for visitors. The heaviest traffic to the park was from the east, entries by the Kicking Horse pass showing 5,268 cars and 17,036 persons. Of these 4,143 cars were Canadian and 1,125 foreign. Eastbound cars totalled 2,847—2,457 Canadian and 390 foreign—carrying 9,395 persons. This is an increase over the previous year of 982 cars and 2,291 passengers.

During the season many betterments were made in the park. The town-site of Field was much improved, trees pruned, and streets regraded. Work on the residence for the park superintendent was started, a new fireproof gasolene and oil house constructed.

The camp sites throughout the park were kept in splendid condition. At the Kicking Horse campsite a new community kitchen was erected and equipped with camp stoves, tables, and benches. Registrations at this camp ground showed 928 cars and 3,328 people. Camps were opened on the roads leading to Yoho and Emerald lakes and these as well as the camp grounds at Field and Chancellor peak were well patronized during the season by the motoring public.

Road Improvement.—A great deal of repair work was done on the main and subsidiary roads. The main highway from the east to the west boundaries of the park was maintained in excellent condition. The road was widened in places and the whole highway oiled. On the two and one-half-mile section of road near Misko the grade was widened. Between the railway crossing and the bridge over the Kicking Horse river, the river bank was mattedress for a distance of about 600 feet. The Ottertail road was graded and the Yoho and Emerald Lake roads improved. On the Yoho road a considerable amount of

log crib work was done to widen the grade to standard width, and 1,600 feet of guard-rail constructed. The whole of the road was surfaced, and the turns at the Switchback widened. Portions of the road were oiled. Travel on the Emerald Lake road is always particularly heavy during the period the Chalet is open, and besides widening the road a great deal of surfacing was necessary to keep it in condition. The roads were regularly patrolled by the Royal Canadian Mounted Police and throughout the season no serious accidents were reported.

In co-operation with the Canadian Pacific Railway Company, park officials commenced improving and developing the area near the Great Divide. On both sides of the summit the stumps and debris are being cleared away. A new channel was made for the creek. At a point just below the main highway the channel was widened to form a pond, at the outlet of which a waterfall was constructed.

Trails.—New trail construction consisted in building an extension to the Otterhead trail up Otterhead creek for a distance of five miles. This will greatly facilitate fire protection work as it makes Otterhead valley accessible to workers with fire equipment. Amiskwi, Summit lake, Emerald lake, Burgess pass, Emerald creek, Upper and Lower Twin falls, President glacier, and Ottertail trails were cleared and repaired. These trails open on some of the most spectacular scenery in the Rockies. Signboards showing mileage were placed at all points of trail intersection.

Wild Life.—Wild life, including moose, deer, and fur-bearing animals, is on the increase. Fishing in the lakes and streams of the park was better than in previous years. Ninety thousand rainbow trout fry were distributed in the park waters from the Banff hatchery. Of these 20,000 were placed in Cataract creek, 10,000 in Ross lake, 25,000 in lake O'Hara, 5,000 in Giddie creek, 20,000 in Emerald lake and 10,000 in Yoho lake.

Fires.—During the season four railway fires were reported but owing to prompt action were quickly controlled. Only one bush fire, caused by lightning, did extensive damage. This outbreak along the river burned over an area of about 1,500 acres.

GLACIER NATIONAL PARK

The season was a quiet one in Glacier park as far as tourist travel was concerned. This may be attributed to the fact that at the present time the park lacks tourist accommodation. Since the dismantling of the old Canadian Pacific Railway hotel at Glacier no new building has been erected. The building of the Big Bend highway through the valley of the Columbia river will no doubt result in increased travel to Glacier park, as the road will skirt the park and open this spectacular Selkirk region to motorists from the Pacific coast and the Prairie Provinces.

Roads.—Early in the season the road gang repaired the road between the railway station and the site of the old Glacier hotel. The Rogers Pass road and the road to the Nakimu caves were graded and repaired. Mount Hermit, Rogers Pass, Flat Creek, Baloo Pass, Beaver River, Grizzly Creek, and Asulkan trails were gone over and put in good condition. An addition was made to the warden's cabin at Glacier. Repairs were also made to the Flat Creek cabin and the caretaker's cabin at the Nakimu caves.

Nakimu Caves.—Development work at the Nakimu caves was continued. The passage-way from Number Two entrance through Satan's Palace to the Ball Room was widened and improved. Concrete and wooden stairways with handrails were constructed. In Number Three cave the stairways were repaired and at points replaced.

Alpine Club.—The Alpine Club of Canada held their twenty-fourth annual camp on the site of the old town at Rogers pass. The visitors, who came from many parts of the world, numbered 142.

Wild Life.—Wild life in the park is plentiful. Goat, caribou, deer, and bear are numerous, and the fur-bearing animals appear to be on the increase, particularly marten and beaver.

KOOTENAY NATIONAL PARK

The Banff-Windermere highway was opened to tourists in May and a good year was reported. There was a slight decrease in travel from the Prairie Provinces attributable to business depression. During the season 16,121 cars carrying a total of 51,772 passengers registered in the park. Of the visitors 39,444 were Canadians and 12,328 citizens of the United States.

The bathing house at the Sinclair Radium hot springs, which was opened last June, had a record attendance. During the season 25,064 bathers made use of the baths. The pool is now 110 feet in length, an extension of thirty feet having been made last October. Three new cabins were erected by the Canadian Pacific Railway company on their property at the Radium hot springs. Further building operations included the superintendent's residence and garage.

Campsites.—Improvements were made to all campsites and at Sinclair Canyon campground two new shelters were erected. During the month of November all the cabins were removed from the Bungalow camp at Vermilion crossing to Storm mountain, with the exception of the main building which was transferred to the Royal Canadian Mounted Police for use during summer patrol work.

Roads and Trails.—The highway was maintained in splendid condition. Double hub rails were placed at curves in the road and no accidents were reported during the season. The old Settlers road from the highway to the southern boundary of the park was made fit for motor travel. This in addition to being of interest to tourists is important for fire protection work, as fire equipment may now be moved and patrols made by car. Two miles of motor road were built from Kootenay Crossing up Kootenay valley and the remainder of the trail cleaned out to the northern boundary of the park. Three miles of trail were also reconstructed up the Hawk Creek valley, and two additional miles of trail cleared. This trail when completed will connect with the Red Earth trail over Ball pass in Banff park now under construction. A survey was made for the location of a trail from Floe lake to Wolverine pass. When this and the Hawk Valley trail are completed a through scenic trail will be provided from Banff to Yoho park via Kootenay park.

Fires.—Although the season was unusually dry no serious fires occurred.

Wild Life.—A marked increase in wild life of all kinds was noted. Along the Kootenay valley bear, moose, and elk were numerous, and hunters during the season reported plenty of game outside the park boundaries.

MOUNT REVELSTOKE NATIONAL PARK

Work was begun on the lower slopes of Mount Revelstoke highway the last week in April. At narrow points the road was widened and put in good shape to the summit of the mountain beyond lake Balsam, where a loop in the road was constructed to facilitate the turning of cars. During the season 1,411 persons registered at the forest outlook station at the summit. This number, however, represented only a percentage of the people who actually entered the park.

Roads and Trails.—The public camping ground laid out in 1928 on the shores of Balsam lake, was extremely popular with tourists. The road leading from the main highway to the lake was conditioned to enable cars to drive right to the campground. An extension of two miles was made to the fire trail commenced last year towards the Clachnacudainn slopes. The trail passes through dense timberland and is an added safeguard for fire-protection purposes. All other trails in the park were cleared and repaired, particular attention being given to the Lindmark and Greely Creek trails, and those leading to Eva and Millar lakes, as the areas to which they lead are of increasing interest to visitors.

The three wooden posts which had been planted by H.R.H. the Prince of Wales, H.R.H. the Duke of Connaught, and H.R.H. Prince Arthur of Connaught, to mark various stages of road construction, were replaced by stone cairns each with a bronze tablet suitably inscribed. The sectionmen's cabins at the four-mile and sixteen-mile posts were repaired and further improvements made on the ski hill. The outside turn on the runway was built up, and benches were constructed for the convenience of spectators. The annual ski tournament was held the first week in February and was well attended.

Fires.—Five fires were reported during the season. With the exception of one, which burned over about one hundred acres of timberland, they were extinguished before any material damage was caused.

PRINCE ALBERT NATIONAL PARK

Over ten thousand tourists visited Prince Albert national park last year, which indicated the increasing popularity of the park as a resort for campers, canoeists, and fishermen. During the month of August the Regina Board of Trade held a convention in the park, there being present 160 persons. A delegation from the newly formed Provincial National Parks Association also spent four days in the park viewing points of interest. Among distinguished visitors during the summer were Lord and Lady Cromer and party.

Building.—Considerable activity took place in the Prospect Point residential subdivision last year. Three new cottages were erected and construction work begun on two. Many inquiries were made about building lots along the southwest shore. When the road to the Narrows is completed this district should be popular as the building sites are in close proximity to lovely sand beaches. In the business subdivision one new store was erected and five lots filed on by firms which propose building early next year. The park superintendent's residence at Waskesiu lake is now ready for occupation.

Campsites.—Last spring the campsite along the main beach of Waskesiu lake was enlarged by underbrushing, clearing and draining. During July and August further extensions were made to this site to accommodate campers. An attractive area was cleared on Kingsmere lake, two small campgrounds were established on Crean lake, and a large one at Sandy lake. The last mentioned is situated half way between Prince Albert and Waskesiu lake, and is made use of by those wishing to break the journey to Waskesiu.

Roads.—The highway to Waskesiu, completed in the fall of 1928, was maintained in good condition. The entire road was gravelled and construction work was also done on the Meridian-Rabbit road.

Air Base.—In view of the great increase in commercial flying in the northern part of Saskatchewan it was considered advisable to establish an air base at Waskesiu lake. This was done and the base was used during the summer and fall by privately owned and Government forestry planes.

Telephones.—The forestry telephone lines were extended to the air base at Wasquesiu lake and to Crean lake. These communications proved very useful in game-protection and fire-suppression work.

Permits and Licences.—Seventy permits and licences were granted last year. These included: 7 timber, 5 building, 14 hay, 10 lot-rental, 5 hay-cutting, and 5 air-base permits; and 14 chauffeur, 3 motor-livery, and 2 boatman's licences.

Fires.—Six fires were reported in the park during the year which were extinguished at a total cost of \$1,489.70. The majority of the fires started outside the south and west boundaries of the park.

Wild Life.—There was a noticeable increase in wild life last season. Moose, deer, and elk were numerous and are becoming quite tame. Caribou, while not so plentiful, were reported in sections of the park where they have not been seen for years. Birds, particularly waterfowl, are multiplying rapidly.

The investigations of the game fish possibilities of the waters of Prince Albert park, which are being carried out through the assistance of the Biological Board of Canada, were continued by a small field staff of trained workers. The general survey begun the previous year was extended by additional work on Crean and Kingsmere lakes and on those waters in the recently added northern section of the park, namely, La Vallee, Burntwood, and Clearwater lakes with their tributary streams.

Detailed observations on possible spawning grounds and water temperature in Wasquesiu lake were also obtained with a view to the experimental introduction of small-mouthed bass into this lake. While the mean temperatures and food conditions are not wholly favourable an experimental planting of adult bass and of fry was recommended. Kingsmere lake was found suitable for game trout and the experimental introduction of the "Kamloops" type was recommended for this lake and speckled trout for MacLennan river. The committee also suggested that additional efforts should be made towards the conservation of the present game fish fauna (1) by modification of the existing game laws to suit the needs of the park and (2) by a campaign for the education of sportsmen and visitors.

ANIMAL PARKS

BUFFALO PARK

Although grazing conditions in the park were poor as compared with other years, the animals were in good condition and came through the winter well. The following table shows the animals in the park on March 31, 1930:—

Buffalo.....	5,016
Elk.....	654
Moose.....	66
Mule deer.....	1,994
Antelope.....	1
Yak.....	33
Domestic cattle.....	13
Hybrid stock.....	20

Farming operations were carried on as usual. Early in April 3,600 bushels of oats were shipped to Banff and Jasper national parks. Due to strong winds and dry weather grain crops were very poor. Weather conditions were, however, good for hay. Approximately 1,500 tons were cut on the Ribstone meadow and 18 tons of rye grass taken off a plot at the farm which had been seeded down two years ago.

Owing to the rapid increase in the buffalo herd, 500 buffalo were slaughtered for sale. Fifty carcasses were reserved by the Department for native relief purposes in the North.

Fencing.—Fence repair work was carried on throughout the season and over 100 miles of fence were put in shape. In addition to this work a change was made in the location of the fence at the northwest corner of the park to include a portion of section 35, township 44, range 8, west of the Fourth Meridian in which there is good grazing. A change was made in the position of the Hardisty gate, and a short piece of fencing constructed near Jamieson lake for the convenience of riders when on the round-up.

Fire Protection.—Fireguards, both inside and outside the main fence, as well as cross guards were ploughed. Practically all this work was done by park teams. Additional hose was supplied for use at the farm buildings and improvements made at the hydrants for quicker service.

Roads.—Maintenance work was done on the new road from Wainwright to the Home Paddock entrance gate, and the old trails which had worn into deep ruts were repaired.

Buildings.—In the fall the park office was moved from the old location at the superintendent's residence to the new Federal Building in Wainwright. Extensions were made to the foreman's cottage and improvements to the riders' boarding house at the abattoir. A well was drilled in the winter quarters to provide water for the buffalo.

Permits.—Dry wood timber permits were issued to settlers living in the vicinity of the park for 175 cords, also for 4,500 green willow pickets.

Predatory Animals.—There was a marked decrease in the number of coyote in the park and most of those destroyed were affected with mange. Altogether nine were shot by the wardens.

Visitors.—During the season 18,753 people registered at the park. The numbers of visitors entering at three of the park gates were as follows:—

Wainwright gate (Home Paddock).....	15,978
Hardisty gate.....	1,666
Farm gate.....	1,109
Total.....	18,753

ELK ISLAND PARK

Visitors to Elk Island park totalled 22,611, which represented an increase of 3,656 over the registrations of the previous year. In addition to the fine herds of animals in the park the bathing beaches and picnic grounds afforded the tourist a wide diversity of entertainment. The buffalo herd was in splendid condition and the wardens reported an increase in moose, elk, and mule deer. During the season two animals—an elk and a moose—were killed for specimen purposes and presented to the museums at Banff and Ottawa. Animals in the park now number 716 buffalo, 398 moose, 500 elk, and 200 deer.

Repair work was carried on as usual. The main fence was put in good shape and all fireguards conditioned. Additional guards were ploughed along the west boundary for a distance of four miles. A lookout tower was erected west of Astotin lake and connected by telephone with park headquarters and the tower and headquarters of the Cooking Lake forest reserve.

Haying operations, owing to the dry season, were not extensive. One hundred and ten tons were stacked, which, with the large tonnage of hay carried over from the previous year, provided a supply for the year's feeding requirements.

Roads.—The roads in the park were maintained in good condition by use of the grader. Several culverts were replaced. The construction of the road from Sandy beach to the main gate was completed and several miles surfaced with gravel.

Wild Life.—Bird life showed an increase. Blue heron nest in numbers on Crane island and migratory birds are plentiful. Prairie chicken and partridge appear also to be on the increase. There was a marked absence of coyotes in the park, only one being killed during the season.

RECREATIONAL AREAS

POINT PELEE PARK

The season was an exceptional one so far as tourist travel was concerned. It is estimated that 20,800 cars entered the park carrying a total of 83,200 visitors. The number of campers who took out permits for less than a four days' stay was 446. Of these 120 were from Ontario and 326 from the United States. Camping permits for more than four days numbered 89; 50 from Ontario and 39 from the United States.

Wild Life.—Wild life was reported on the increase. Squirrel, raccoon, and muskrat were plentiful. Quail were about the same in numbers, while pheasant showed a marked increase. Migratory birds were never more plentiful. Wild duck—black, grey, and blue-bill—were present in thousands. A great many whistling swan were seen in the marshes, and during the spring and fall migrations of wild geese were abundant.

HISTORIC PARKS

FORT ANNE NATIONAL HISTORIC PARK

The total number of visitors to Fort Anne park for the calendar year was estimated at 18,000. Of these, 13,516 were shown through the museum, an increase of 2,126 over the record for 1928. Among the notable visitors were a party of ninety members of the Canadian Women's Press Club; the captain and seven other officers of the French warship *Aldabaran*; officers of H.M.S. *Cape-town*; Hon. William Phillips, United States Minister to Canada, and Mrs. Phillips; M. Carteron, the Consul General for France, and Madame Carteron; the Right Hon. Lord Pentland; and Mr. and Mrs. E. R. Warren, of Boston, Mass. Mrs. Warren is a direct descendant of Paul Mascarene, the officer who mounted the first British guard in Fort Anne on the taking of the place in 1710.

On July 3, a party from Central Canada numbering 180 visited the fort. The Raymond-Whitecomb Tourist Agencies in August brought 73 visitors. On September 3 there was an excursion of 94 persons, members of the Schuetzen Club of New York. The teachers and pupils from the Annapolis County Academy visited Fort Anne on three occasions in November and once in December.

Several interesting discoveries have been made in the fort grounds during the year. During a visit to the Canadian Archives at Ottawa in November, 1928, the Honorary Superintendent was able to examine some old pictures of Annapolis Royal, dated 1751, which showed a blockhouse about which nothing had locally been known. Photographs of the pictures were obtained and with their aid the site was discovered. After some digging the foundation of the blockhouse was revealed. On the War Office plan of the fort in the Provincial Museum at Halifax the blockhouse shown in the picture is plainly marked and also another one hitherto unknown east of the fort, the exact location of which it will require a surveyor to determine.

Through the agency of the Historical Association of Annapolis Royal, Fort Anne came into possession of a fine portrait in oils of Queen Anne. The canvas is 25 by 30 inches and the picture is enclosed in a valuable old English carved gold frame. Another valuable gift received from the same association was a water-colour picture of Lieutenant George Wedderburn, of the 76th Regiment, who was the last commandant of Fort Anne, leaving in 1854 when the place was finally abandoned as a military post.

Protection of Migratory Birds

In June last, amendments were made to the regulations based on the *Migratory Birds Convention Act*, following the receipt of suggestions from the different provincial game officers and the chief federal migratory bird officers. A number of changes were made throughout Canada. The close season for the following migratory game birds was extended for an additional period of three years: little brown, sandhill, and whooping crane, swan, curlew, greater and lesser yellow-legs, black-bellied and golden plover, and all shore birds, except Wilson's or jack-snipe and woodcock. It was provided that lying in wait with firearms, with or without decoys, for migratory birds, should be considered *prima facie* evidence of hunting. The daily bag limit for woodcock was reduced from ten to eight, and a seasonal bag limit placed upon this species in the provinces in which it occurs. In Nova Scotia, the season for duck and rail, and goose and brant was changed. In New Brunswick, the opening date for the shooting of Wilson's snipe and woodcock on the islands in the Grand Manan group was made to coincide with that for duck, goose, brant and rail, in that part of New Brunswick. In Ontario, the season for taking Wilson's snipe was made to coincide with that for duck, goose, brant, and rail. In the province of British Columbia, the use of decoys of any kind in the hunting of band-tailed pigeon was prohibited, and the special provision concerning the hour at which shooting might begin on the first day of the open season was changed.

The staff for enforcing the *Migratory Birds Convention Act* continues at the same strength and there has been complete co-operation with provincial game departments. In accordance with the original plan the enforcement of bird protection measures has been left largely in the hands of the provincial authorities, thus avoiding duplication.

Some hundreds of honorary game officers co-operated with the branch in enforcing the law, and in furnishing valuable information respecting bird conditions in their localities. Honorary officers were kept informed on bird protection subjects by a system of circular letters. The members of the Royal Canadian Mounted Police helped materially by enforcing the law and by conducting bird observations in various districts, and Dominion Fishery officers lent valuable assistance as well. A staff of officers was maintained in the Maritime Provinces for the enforcement of the migratory bird law. All members of the New Brunswick provincial police were appointed *ex officio* game officers under the *Migratory Birds Convention Act*.

Drought throughout a large part of the Prairie Provinces greatly affected water-bird life during 1929. In parts of Saskatchewan there was believed to be a reduction of nearly ninety per cent in the number of duck raised, and conditions were probably as bad in some other parts of the prairie breeding area.

In addition to his general duties, the Chief Federal Migratory Bird Officer for the provinces of Ontario and Quebec, with the aid of a staff of temporary assistants and the bird sanctuary caretakers, carried out valuable protection work with respect to the abundant sea-bird life on the north shore of the gulf of St. Lawrence in Quebec during the summer.

The Chief Federal Migratory Bird Officer for the western provinces, while devoting much time to co-operative work with the provincial game authorities, was occupied as well in supervising the sanctuaries and public shooting grounds in these provinces and in making inspections of lands reserved. The latter work was undertaken jointly by the province, the Dominion Lands Administration and this branch.

Ninety-one prosecutions were instituted by Dominion officers in connection with the enforcement of the *Migratory Birds Convention Act*. These resulted in 83 convictions. Prosecutions instituted by provincial officers are not included in this summary.

Oil Pollution.—The department has worked in conjunction with the Department of Marine and Fisheries respecting the loss of bird life by oil dumped from vessels in navigable waters, or reaching navigable waters in other ways, and all losses of bird life from oil have been referred to that department. Following the conference at Washington, in which Canada took part, a draft convention on oil pollution of the high seas was prepared, but no international agreement for control has yet been concluded.

Bird Censuses.—The investigation to learn the distribution and movements of waterfowl, and their fluctuation in numbers from year to year, undertaken by this branch and the United States Biological Survey, was continued and has resulted in valuable data being collected from hundreds of wildfowl observers. Bird censuses taken on Christmas day were made at many points by members of the various naturalists clubs and by the officers of this branch. At Ottawa twenty-four species were found. Bird censuses taken from year to year give a comparative idea of the distribution of bird life at a time when it is at its lowest ebb.

Permits and Licences.—Permits and licences were issued for the calendar year 1929 as follows:—

Collection of birds for scientific purposes.....	355
Possession of birds for propagating purposes.....	549
Capture of birds for propagating purposes.....	38
Destruction of certain birds when found to be seriously damaging agricultural or fishery interests.....	66
Permits allowing the shooting of predatory birds in bird sanctuaries, etc.....	11
Taking of birds for banding purposes.....	110
Practising taxidermy.....	70
Shooting of geese and brant in Shelburne, Queens and Halifax counties, Nova Scotia, in the open season provided by law.....	615

Investigations.—Mr. J. Dewey Soper, by the co-operation of this Branch and the North West Territories and Yukon Branch, in 1928 was sent to south-western Baffin island, for the purpose of studying birds and mammals, and especially to find the breeding grounds of the blue goose. He was successful in locating these breeding grounds. Assistance was extended Mr. Soper in various ways. His report of the discovery has been published by the North West Territories and Yukon Branch.

Bird Banding.—The Branch worked in full co-operation with the United States Biological Survey in tracing and recording migrations of birds by banding. Nearly all the work is done by voluntary co-operators. The official records of bird-banding returns for Canada are kept in this branch. From January 1, 1929, to December 31, 1929, 16,634 records of birds banded by Canadian co-operators and 7,955 repeats and returns on birds already banded were received, an increase of 5,977 records over last year, and of 5,430 repeats and returns.

Sanctuaries for birds are increasing everywhere; small estates, villages, golf courses, air ports, and lakes with bordering marshes are being included. Action

to reserve sanctuaries in Canada would not be effective if sanctuaries were not reserved in the United States. Consequently, it is of great interest to Canadians to know that the work of establishing sanctuaries is progressing in that country.

Public Shooting Grounds.—Certain lands near Pitt lake, British Columbia, were reserved for public shooting-ground purposes.

Educational Work.—Various camps attended by young people were visited, and instruction given in bird protection and natural history subjects. Requests for lectures on wild-life conservation were received from more than forty organizations that conduct summer camps for young people. The total distribution of pamphlets amounted to 72,783. Publicity concerning the shooting season and other bird protection matters was obtained through the distribution of 44,710 posters, 22,783 copies of the *Migratory Birds Convention Act*, and 24,819 abstracts of the regulations under it. Circular letters regarding the changes in the regulations for the season 1929 were distributed to the press throughout Canada.

Numerous lectures on bird protection were given by members of the permanent staff, and lantern slides were furnished to the honorary game officers and others for lecture purposes. Addresses on birds and bird protection were delivered over the radio. The lantern slide library contains 5,365 slides covering 1,143 subjects, and showing 391 different species of birds. In all, 3,079 slides were loaned free of charge.

Bird-House Competitions.—Much interest has been shown in the building of bird-houses, and bird-house competitions have been held under various auspices throughout Canada.

Contact with Scientific and Conservation Organizations.—During the year the branch was represented at the following national and international meetings interested in the protection and conservation of wild life:—

September, 1929—Meeting of International Association of Game, Fish and Conservation Commissioners, at Minneapolis, Minnesota.

October, 1929—47th stated meeting of the American Ornithologists' Union, at Philadelphia, Pennsylvania.

December, 1929—National Game Conference of the American Game Protective Association at New York, N.Y.

December, 1929—Meeting of the Province of Quebec Association for the Protection of Fish and Game at Montreal, P.Q.

March, 1930—Organization meeting of the Canadian Game Protective Association, at Ottawa, Ontario.

Historic Sites and Monuments

During the past year, work in connection with the preservation and marking of historic sites or structures eminently national in character, was carried on. In addition a number of sites were acquired on which to erect memorials and a scheme of development formulated for some of the larger areas already controlled. The annual meeting of the Historic Sites and Monuments Board, which acts in an advisory capacity to the Department of the Interior regarding all historic matters, was held in Ottawa, when a large number of sites were reviewed and from these a selection made for attention in future years.

Since the inception of this work, in 1919, approximately 950 sites have been under consideration and from these the Board has selected 246 as being of national importance and recommended them to the Department for preservation or marking. The Board has also suggested the marking of the birth-places of a number of outstanding personages in Canadian history by tablets bearing appropriate inscriptions.

Sites Marked

In previous reports a summary of sites already marked, now numbering 150, will be found. During 1929-30 the following sites of national importance were marked and the services of important personages commemorated by the placing of tablets and the erection of monuments:—

Admiral d'Anville's Encampment, near Halifax, N.S.—A rubble-stone cairn, with a bronze tablet affixed, was erected on a plot of land donated by Mr. E. Clayton, at the intersection of the Old French Landing and Bedford roads, to mark the place of encampment of the formidable but storm-shattered expedition sent from France under the command of Duc d'Anville, in 1746, to recover Acadia.

Fort La Have, La Have, N.S.—A cairn with tablet was erected on the light-house reserve at Fort Point, La Have, to mark the site of the fort built by Isaac de Razilly, Lieutenant-Governor of Acadia, in 1632, from which headquarters he administered the colony.

Fort Jemseg, Lower Jemseg, N.B.—A cut-stone monument with tablet, enclosed by an iron fence, was erected on a small plot of land donated by Mr. F. C. Nevers, to mark the site of the fort built in 1659 by Col. Thomas Temple, Governor of Acadia. This was the first trading post established by the English on the Saint John river.

Battle of the Petitcodiac, Hillsborough, N.B.—A cut-stone monument with tablet was erected near the railway station at Hillsborough to commemorate the events associated with the engagement which took place in the vicinity in September, 1755, between British troops from Fort Beauséjour and a French force commanded by Charles Deschamps de Boishebert.

Major Gilfrid Studholme, St. John, N.B.—A cut-stone monument with tablet was erected on Fort Howe hill to commemorate the public services of Major Gilfrid Studholme, a notable figure in the early history of New Brunswick. Major Studholme built Fort Howe in 1778 and was its commander. He zealously assisted the settlement of United Empire Loyalists.

Battle of Chateauguay, Allan's Corners, P.Q.—A tablet was affixed to the granite monolith, which stands on the site, to commemorate the victory of a small Canadian force and a little band of Indians under the command of Lieut. Colonel Charles Michel de Salaberry over a large body of United States troops which attempted the invasion of Canada on October 26, 1813.

The Royal Navy, Ile-aux-Noix, P.Q.—A tablet was affixed to the gateway at the south entrance to Fort Lennox to perpetuate the memory of the services of the officers, seamen, and soldiers of the Royal Navy, Royal Marines and Provincial Marines, who fought in defence of Canada on lake Champlain in 1776-77 and 1812-14.

Battle at Montgomery's Creek, near St. Johns, P.Q.—A cairn with tablet was erected on the St. Johns Golf Club property, adjacent to the King's Highway, to commemorate the events associated with the battle of September 6, 1775, when Montgomery's invading army, surprised by a force of Mohawks and Canadian Indians, was compelled to re-embark and retire to Ile-aux-Noix.

Coteau-du-Lac, P.Q.—A cairn with tablet, was erected adjacent to the public road at Coteau-du-Lac to commemorate the early events associated with that place. A canal was constructed in 1779-80; later a blockhouse, and then a fort were built for its protection. These proved of valuable service during the wars of the American Revolution and of 1812. Coteau-du-Lac was for many years the chief port of entry for imports into Upper Canada.

First Railway in Canada, St. Johns, P.Q.—A tablet was affixed to the railway station at St. Johns to mark one terminal of the first railway in Canada which led originally to Laprairie and was constructed to connect lake Champlain with the river St. Lawrence. It was opened for traffic on July 21, 1836, by Lord Gosford.

Bishop Alexander Macdonell, St. Raphael, Ont.—A cut-stone monument with tablet was erected adjacent to the public highway in front of the parish church at St. Raphael West to perpetuate the memory of the Honorable and Right Reverend Alexander Macdonell, patriot, military chaplain, educator, and legislator who lived and laboured with success at this place for many years.

Niagara Portage Road, Stamford, Ont.—A stone monument with tablet was erected on Stamford village green, adjacent to the Portage road, to commemorate events associated with the Queenston-Chippawa portage road, opened by United Empire Loyalists in 1788. This was the principal route of travel and trade to the Upper Lakes region until the opening of the Welland canal in 1829, and the completion of railway lines in 1854.

Ridgeway Battlefield, Ridgeway, Ont.—A cairn with tablet, was erected on a plot of land, adjacent to the Garrison road, donated by the township of Bertie, to perpetuate the memory of the officers and men who fought there in defence of Canada against Fenian Raiders on June 2, 1866.

Starting Point Brock's Expedition, Port Dover, Ont.—A cairn with tablet was erected in Powell park to mark the spot from which Major General Isaac Brock set out with his army of three hundred men, on August 8, 1812, to relieve the invaded western frontier. His brilliant capture of Hull's army at Detroit, with a much smaller force, saved this province to the Empire and made Brock the hero of Upper Canada.

First Electric Telegraph, Toronto, Ont.—A tablet was affixed to the St. Lawrence market building, which now stands on the site of the old city hall of Toronto, to mark one terminal of Canada's first electric telegraph line, connecting Toronto with Hamilton, inaugurated December 19, 1846.

Fort Fork, Alberta.—A cairn with tablet was erected adjacent to the road allowance passing through Lot 19, Shaftesbury settlement, to mark the site of the fort built by Sir Alexander Mackenzie, on the east bank of the Peace river, in 1792, and from which he set out in the following year on his quest for the Western Sea. This first crossing of North America north of Mexico, stimulated the commercial development which saved a coast on the Pacific to Canada and the Empire.

The Last Spanish Exploration, Point Grey, B.C.—A cut-stone monument with tablet was erected on the British Columbia University grounds, between the waters of English bay and the Marine drive, in commemoration of the first friendly meeting of the British and the Spaniards in these waters. The British commander, Captain George Vancouver, established mutual confidence and exchanged information with the Spaniards, Galiano and Valdes, and they then continued the exploration together.

Fort Steele, B.C.—A cairn, with tablet, was erected on a plot of land donated by Mr. William A. Drayton, adjacent to the Fort Steele-Fernie highway, to mark the site of the first North West Mounted Police fort in British Columbia, built in 1887 by Superintendent Sam Steele. The presence of this force secured peace and order in the country at a critical time.

Preservation Work

At several larger sites preservation work and improvements were carried out.

Fort Cumberland (Beauséjour), N.B.—The earthworks were repaired, the entrance to the park improved, and a number of markers erected to indicate the various points of historic interest.

Louisbourg, N.S.—The several buildings, vacated by property owners whose rights had been purchased, were demolished and removed; the area fenced; the casemates cleaned out and repaired; and a road built and surfaced from the gateway to the headquarters building.

Fort Chambly, Chambly, P.Q.—Masonry and concrete retaining walls were erected along the river front; a dry stone wall was built along the north side; and the inner walls were repaired and pointed.

Fort Lennox, Ile-aux-Noix, P.Q.—Extensive repairs were made to the north bridge across the moat, improvements made to several buildings, and the moat cleaned.

Fort Wellington, Prescott, Ont.—The blockhouse was re-shingled and painted, the inner palisades repaired and other improvements made to the museum and grounds.

Acquisition of Sites

Arrangements for the acquisition or control of a number of sites recommended by the board were made.

Fort Monckton (Gaspéreau), N.B.—An additional area of two acres was purchased with a view to future development work.

Fort St. Peters, St. Peters, N.S.—The Department of Railways and Canals granted authority for the erection of a memorial on their reserve at St. Peters to mark the site of the fort and trading post built by Nicholas Denys, in 1650.

First Coal Mine in Cape Breton, Port Morien, N.S.—The Dominion Coal Company has donated a plot of land for the erection of a memorial to commemorate the events associated with the establishment by the French in 1720, of the first regular coal mining operations in America.

Fort Ste. Anne, Ste. Anne, N.S.—Mr. George E. Fader has donated a plot of land twenty-five feet square, adjacent to the Baddeck-Cape North highway, on which to erect a memorial to mark the site of the fort built there in 1629, for the protection of the French settlement.

First Atlantic Cable, North Sydney, N.S.—The Western Union Telegraph Company has granted permission to place a tablet on the outer wall of the company's cable building at North Sydney to commemorate the events associated with the laying of the first submarine telegraph cable in North America in 1856. This cable connected Cape Breton with Newfoundland.

Wolfe's Landing, Kennington Cove, N.S.—Mr. D. A. McInnis has donated a plot of land on Gabarus bay, with a right of way from the main road, for the erection of a memorial to mark the landing place of Brigadier General James Wolfe's brigade, on June 8, 1758.

First Export of Coal, Minto, N.B.—The Canadian Pacific Railway Company has granted permission for the placing of a memorial on their station grounds at Minto to commemorate the events associated with the discovery and mining of the first coal for export in Canada.

Chambly Canal, Chambly, P.Q.—The Department of Railways and Canals has granted permission for the erection of a memorial on the canal reserve at Chambly to commemorate the events associated with Chambly canal, which was first opened to navigation in 1843.

Benjamin Sulte, Three Rivers, P.Q.—The city of Three Rivers has granted permission for the erection of a bronze plaque at the entrance to the city hall to commemorate the public services of Benjamin Sulte, historian and poet.

First Geodetic Survey Station, Kingsmere, P.Q.—Mr. M. Mulvihill has donated a plot of land twenty-five feet square on King mountain on which to erect a memorial to mark the site of the first Geodetic Survey station in Canada established in 1905.

Opening of St. Lawrence River to All Nations, Quebec.—The Quebec Harbour Commission has granted permission to place a tablet on the wall of the waiting room at the Princess Louise docks, to commemorate the opening of the St. Lawrence to all nations, January, 1850.

Mattawa Portage, Mattawa, Ont.—The Women's Institute of Mattawa has granted permission for the erection of a memorial in a small park controlled by them at the intersection of Main and Water streets, to mark one of the principal portages of the historic canoe route from Montreal to lake Huron and the Northwest.

Southwold Earthworks, near St. Thomas, Ont.—An area of five acres, north of Talbot road, was purchased on which a memorial is to be erected to mark the site of an old Indian stronghold, a unique example of a double-walled aboriginal fort, the origin and antiquity of which remain unknown.

Dominion Lands Survey System, near Winnipeg.—Senator Aimé Bénéard and Mr. John T. Haig have donated a plot of land twenty-five feet square, adjacent to the Portage highway, at its intersection with the First Principal Meridian, on which to erect a memorial to mark the site of the first monument on the Dominion Lands Survey, July 10, 1871.

Simon Fraser, Musqueam, B.C.—The Provincial Government has granted permission for the erection of a memorial at Look-Out Point, adjacent to Marine drive, at the west end of the Musqueam Indian Reserve, to mark the place where Simon Fraser ended his adventurous and dangerous exploration of the Fraser river in July, 1808.

APPENDIX

Alpine Club of Canada*Report of the Secretary—Banff Club House, 1929*

Members of the Alpine Club at Banff had a most successful season. Special camp arrangements attracted an unusual number of visitors who made the club house their headquarters for climbs and expeditions in the neighbourhood. Five new cabins were built to replace the original tent houses, making thirteen cabins in all, comfortably furnished, available to members.

The club house was a centre of information for climbing enthusiasts in all mountain matters. Contributing factors to the delightful time spent by members were the improved transportation facilities and good roads, which greatly increased the radius in which one-day outings could be made from Banff.

The usual climbs of the surrounding peaks were made, including the east face of Castle mountain—which for the first time was scaled by a lady—and the peaks in the Fairholme range. One of the outstanding mountaineering feats was a first ascent of mount Sir Alexander by three members of the club from New York: Miss H. I. Buck, Dr. H. J. Gilmour and Mr. E. L. Woolf.

Those in attendance were drawn from England, Scotland, Australia, Germany, China, the United States, and Canada.

Report of the Secretary—Rogers Pass Camp, 1929

The twenty-fourth annual camp of the Alpine Club of Canada was held from July 15 to 31, 1929, in the Selkirk range. Camp was made on the site of the old railway village at Rogers pass in view of the peaks of the Hermit range. A subsidiary camp was pitched at the Hermit hut, about two thousand feet above the valley, and proved an excellent base for climbing. From here mounts Rogers, Tupper, Hermit, and Sifton were ascended by various parties.

The camp differed in several ways from those of other years. When the Connaught tunnel was opened the former railway right of way through the pass was turned into a road and a motor truck became a practical and much-used convenience, as it served the purpose of a passenger omnibus for those who wished to climb the peaks in the Sir Donald chain of mountains and the Asulkan and the Dawson ranges.

Only two days of bad weather were experienced out of the seventeen spent in camp. Of these one was devoted to the annual meeting. The camp fire meetings were greatly enjoyed and proved most interesting. Meetings were addressed by visitors from many parts of the world. One hundred and forty-two members were placed under canvas, including representatives of the Alpine Club, England; the French Alpine Club; the American Alpine Club; the Swiss Alpine Club; the Appalachian Mountain Club; the B.C. Mountaineering Club; the Sierra Club; the Mazamas; the Mountaineers; and the Royal Geographical Society.

The principal mountains climbed were mounts Tupper, Rogers, Avalanche, Eagle, Uto, Sir Donald, Cheops, Ursus Major, Sifton, Selwyn, and Hasler.

Those present were drawn from the following countries: Canada, England, and the United States.

V

WATER POWER AND RECLAMATION

REPORT OF THE DIRECTOR AND CHIEF ENGINEER OF WATER POWER, J. T. JOHNSTON

INTRODUCTORY

The organization of this service remains the same as for previous years and the reader is referred in this connection to the Annual Report of the Department of the Interior for the fiscal year ended March 31, 1926.

INTERNATIONAL WATERWAY MATTERS

During the year, international waterway problems received continuous attention, appropriate action being taken from time to time in connection with the various matters arising.

The Convention and Protocol signed between Canada and the United States on January 2, 1929, providing for the construction of remedial works at Niagara falls for the preservation and enhancement of the scenic beauty and for the concurrent experimental withdrawal of water from the Niagara river during the winter or non-tourist season, for the purpose of testing the effectiveness of the remedial works, was ratified by Dominion Parliament on May 20, 1929. The Convention still awaits ratification by the United States Senate.

The suit of the complainant states of Wisconsin, Minnesota, Pennsylvania, and Ohio versus the Chicago Sanitary District before the United States Supreme Court, with reference to the diversion of water from the Great Lakes system through the Mississippi watershed, has been closely followed throughout the hearings. In compliance with the decision of the Supreme Court released on January 14, 1929, Special Master Charles Evans Hughes was instructed to make a further examination into the situation to determine the practical measures needed to give effect to the court's finding and to determine the period required for their completion. The Special Master was authorized to hear witnesses, and with all convenient speed to make a report of his conclusions and of a form of decree.

In compliance with these instructions, Special Master Hughes held a hearing in Chicago on March 25 to 29, 1929, with subsequent hearings at Washington on April 15 to 26. A further hearing was held on September 23 to 25. Oral argument before the Special Master was held October 2, 3, and 4, and the Special Master submitted his final report to the Supreme Court late in December, 1929.

At the expiration of the time to file exceptions to the Special Master's report, the Supreme Court set March 12, 1930, for the hearing of oral argument on the exceptions filed by the litigants. Oral argument was submitted before the court on March 12 and 13. The court had not up to March 31 handed down its decision.

The Lake of the Woods Convention between Canada and the United States executed on February 24, 1925, provides for the securing of a flowage easement up to elevation 1064 sea-level datum on the United States shore of lake of the Woods and accords to Canada the privilege of representation by counsel should the costs be determined by means of the usual judicial procedure in the United States. In accordance with this provision Canada has been represented by

counsel in the proceedings which have been taken before the United States Federal courts in Minnesota. Commissioners for the evaluation of the lands were appointed in August and September, 1928, hearings being held early in December, 1928, and in February and March, 1929, relative to the instructions given to the commissioners.

The awards of the commissioners in the first petition comprising about two hundred claims were filed with the United States District Court, District of Minnesota, Sixth Division, on May 4, 1929. These awards were excessive and appeals were filed by the Governments of the United States and Canada. The United States District Court appointed commissioners to appraise claims in the second petition at Fergus Falls, state of Minnesota, U.S.A., on May 28 at the regular sitting of the court after hearing argument by counsel. The awards of the second petition were filed in the court in August and as these awards were on the whole satisfactory, very few appeals were registered by the governments but a large number were appealed by the counsel for the landowners. On August 12 the Federal District Court appointed the commissioners to appraise the claims in the third petition. The awards were filed on November 27, 1929. A number of the awards were appealed both by the governments and by the landowners.

The Federal District Court, comprising two judges without a jury, sat to hear the appeals of ten test cases in the first and second petitions. The court proceedings opened on November 7 and closed on November 22, 1929. All parties, including the Dominion of Canada, were represented by counsel and took part in the oral and written argument before the court. Complete written briefs were filed. As yet the court has not handed down its decision.

The Lake of the Woods Convention also provided for a reference to the International Joint Commission of the question of storage in Rainy lake, and in the boundary waters above, and of the development of power in connection therewith. After extensive field and office investigatory work the interim report of the engineers to the commission, incorporating the basic data upon which the problem can be properly studied, has been published, and office investigatory work has been carried out in connection with the final report.

The international problem of the Roseau river which has been referred by the Governments of the United States and Canada to the International Joint Commission for investigation and report was under active consideration throughout the year. Following public hearings which were held at Roseau, Minnesota, on June 6, and at Vita, Manitoba, on June 7, the commission, in a report addressed to both governments, found that the flood protective works which were being constructed by the Dominion Department of Public Works on the Canadian side of the boundary would not have the effect of raising the natural level of the Roseau river on the United States side of the boundary. These works were subsequently proceeded with and were brought to completion on February 15, 1930. At the hearings, the department's interests were represented by counsel and by the District Chief Engineer of Manitoba.

In accordance with the other questions of the Roseau River Reference, arrangements were made for a topographic survey of certain portions of the watershed in Canada. This survey was carried out during the summer months and the information was compiled in the form of map-sheets during the following winter. All work has been closely co-ordinated with that being done on the United States side of the border.

The application of the West Kootenay Power and Light Company to the International Joint Commission for permission to construct and operate certain permanent works in and adjacent to the channel of the Kootenay river at Granite, British Columbia, for the purpose of storing water in, and regulating the outflow from, Kootenay lake was submitted to the commission in September, 1929.

Basic investigatory work had been under way for some time by this service with a view to analyzing the hydraulic features of the application, and the effect of the proposals on the water levels at the international boundary. The application was heard by the commission at Bonner's Ferry in the United States on November 6 and 7, 1929, at which hearing representations were made on behalf of the Canadian and United States interests involved. The department's interests were represented by the Director and by the District Chief Engineer of British Columbia. Initial construction work was authorized by the commission and further investigatory work was undertaken in the field, with a view to analyzing further the effects of the proposals upon the drainage interests above and below the international boundary. Following the completion of this work, a further hearing will be held by the commission.

Other problems have been active along the international boundary throughout the year, such as those arising with regard to lake Memphremagog levels, the proposed power development on the Pend d'Oreille river in British Columbia and the effect thereon of the Columbia River reclamation project in the United States. Following arrangements made between the Governments of Canada and the United States an investigation was carried out with respect to the establishment of international gauging stations on the rivers crossing the international boundary from lake of the Woods to the Pacific coast.

The various International Waterway Boards have functioned as usual throughout the year.

In accordance with the order issued on October 4, 1921, by the International Joint Commission in conformity with the provisions of the Boundary Waters Treaty of 1909, the measurement and apportionment of the stream flow in the St. Mary and Milk rivers and their tributaries in the provinces of Alberta and Saskatchewan and in the state of Montana, were continued throughout the past year by an engineer of this service in co-operation with an engineer of the United States Geological Survey. The report covering the year's operations has been prepared and submitted to the commission for review upon the occasion of its regular semi-annual meeting in April.

The Lake of the Woods Convention provided for two boards for the control of the lake levels and the outflow therefrom—the Canadian Board and the International Board. The Canadian Lake of the Woods Control Board has continued the regulation of lake of the Woods between elevations 1056 and 1061 sea-level datum, as elsewhere recorded in this report. The International Lake of the Woods Control Board is called upon to exercise certain responsibilities whenever the lake rises above elevation 1061 or falls below elevation 1056. On March 18, 1930, lake level was drawn below elevation 1056 and the rate of total discharge of water from the lake became subject to the approval of the International Board. On March 31, lake level had ponded at elevation 1055.82.

Under the Convention, the International Board is also charged with the responsibility of approving certain protective undertakings to be constructed on the United States shore of the lake. These works have been approved from time to time as completed.

The International Lake Superior Board of Control continued to exercise its responsibilities with regard to the regulation of lake Superior throughout the year. Records of discharge through the rapids, navigation canals, and power plants on both sides of the river, were systematically reported to the board. The calibration of the sluices of the control dam and of the other outlets was continued. The minimum mean monthly elevation of 602.43 occurred in the month of February, and the maximum of 602.90 occurred in the months of July and August, these stages being well within the limiting range of 602.1 to 603.6 as prescribed in the orders of the commission. The elevation of the lake for January 1, 1929, was 602.84, and the elevation for January 1, 1930,

was 602.41, a net lowering of 0.43 feet during the year. The mean discharge for the year was 65,539 cubic feet per second or about 10,400 c.f.s. less than the mean for 1928.

The International Niagara Board of Control continued its control over the diversions from the Niagara river for power purposes as permitted by Article 5 of the Boundary Waters Treaty. The board is in receipt of continuous hourly records of the withdrawal of water by all power stations on both sides of the river and the control exercised is such as to ensure that the limits of the diversion set forth in the treaty are not exceeded.

The International Massena Board of Control continued to exercise its supervision over the conditions obtaining with respect to the submerged weir in the South Sault channel of the St. Lawrence river and the regulation of flow through the Massena canal in accordance with the order of the International Joint Commission dated December 6, 1922. The board was in receipt of regular monthly reports showing the amount of water diverted and the power house performance from day to day. During the open water season of 1929 the maximum mean daily diversion reported was 25,040 second feet, the minimum 18,700 second feet. The mean daily diversion exceeded 25,000 second feet on one day only. The recorded monthly mean at Lock 21 varied from 201.60 to 203.16. The elevations at the lock were improved by the operation of the submerged weir, the increased height of water surface above natural conditions varying 0.55 to 0.73 feet, which is a decided improvement for navigation conditions.

The International St. Croix River Board of Control continued to exercise its supervision over the discharge of the St. Croix river past Grand Falls dam in accordance with the orders of the International Joint Commission dated November 9, 1915, and October 3, 1923. The board was in receipt of regular reports of the discharge of the river and of the water elevations above and below the Grand Falls dam. No abnormal conditions developed during the year. General satisfaction was expressed by responsible officers with regard to the supply of water on the river below, both for power and for the purposes of fishway operation.

WATER POWER

CANADIAN LAKE OF THE WOODS CONTROL BOARD

The Canadian Lake of the Woods Control Board continued to function throughout the year. The International Board is elsewhere referred to in this report. A complete history of the formation of these boards appears in chapter V of the Annual Report of the Department of the Interior for the fiscal year ended March 31, 1929.

Lake of the Woods Regulation.—During the fiscal year, the inflows to lake of the Woods were below normal and the board was chiefly concerned in conserving storage in order to be able to maintain a dependable rate of outflow for power purposes. Due to deficient precipitation and a high rate of evaporation, lake level was steadily drawn down from elevation 1059.75 on April 1, 1929, to elevation 1056.0 on March 17, 1930. By virtue of the provisions of the Lake of the Woods Convention, when lake level falls below this latter elevation the regulation of the outflow from the lake becomes subject to the approval of the International Lake of the Woods Control Board. Through the courtesy of the United States member of the International Board, arrangements were made to draw the lake level to elevation 1055.80 in order to ensure sufficient water for power purposes at the lake outlets and on the Winnipeg river below during the period preceding the spring break-up. On March 31, 1930, lake level was ponded at elevation 1055.82.

Throughout the fiscal year the board was indebted to the Department of Public Works for run-off records on Rainy and Namakan lakes, and to the Dominion Meteorological Service and the Weather Bureau, United States Department of Agriculture, for precipitation and temperature records at the numerous meteorological stations throughout the watershed.

Lac Seul Regulation.—The Lac Seul conservation dam was completed on May 1, 1919, and arrangements were made that until the matters of foreshore rights and protective works have been settled, the control of the level and out-flow of the lake would remain in the hands of the Ontario Government. During the fiscal year the control of the lake has been in complete co-ordination with the control exercised by the board over the regulation of lake of the Woods.

WATER POWER REGULATIONS AND LEGAL RESEARCH

The Dominion Water Power Regulations were amended by Order in Council of December 3, 1929, which replaced the current wages clause introduced into the regulations in 1928 by a fair wages clause requiring that fair and reasonable rates of pay and hours of labour, to the satisfaction of the Minister of Labour, are to be in force in the construction, alteration, extension, maintenance and operation of the works authorized by a water-power licence. An interim licence under the regulations was issued authorizing the development of the Slave Falls site on the Winnipeg river in Manitoba. The study of Dominion and provincial legislation and jurisprudence relating to the use of water has been continued.

BRITISH COLUMBIA ADMINISTRATION

Water rights granted by the province of British Columbia in the Railway Belt under the provisions of the *Railway Belt Water Act* have been examined for the protection of Dominion interests, and the District Chief Engineer at Vancouver has kept in close touch with the construction operations of the Western Power Company of Canada at Ruskin, on the Stave river, and has made a final inspection of the diversion tunnel and power-house of the Burrard Power Company's Alouette Lake development. Applications for water records for the benefit of Indian reserves in the various parts of the province have been prepared on behalf of the Department of Indian Affairs, and surveys and investigations made in connection with securing water licences and in support of Indian claims to the use of water.

ENGINEERING CO-OPERATION WITH THE DEPARTMENT OF INDIAN AFFAIRS

In Ontario a report was made on repairs necessary at the power dam of the Indian school near McIntosh, and the water supply and sewage disposal plants for the Cecilia Jeffrey Indian school near Kenora were constructed at a cost of \$12,285. In Manitoba reports were made on water supply and sewage systems for Indian schools near Brandon and Birtle, and repairs made to the existing systems at the Brandon school amounting to about \$2,800.

In Saskatchewan additional machinery costing \$1,003 was installed in connection with the water supply of the Onion Lake Indian school, and repairs made to the water supply and sewage systems at Ile à la Crosse hospital at a cost of about \$2,200. In Alberta reports were made on improved water supply for existing schools at St. Bruno on Lesser Slave lake, and at Edmonton, and reports prepared on a site for a new school to be erected near St. Paul de Metis. A deep well was drilled near the site selected at a cost of \$3,398.

In British Columbia a large number of investigations were made in all parts of the province and the local staff of the service also supervised the construction of important improvements made in connection with Indian reserves,

villages and schools. The investigations carried out numbered 32, of which 9 were for irrigation projects and improvements; water supply, 13; electric light and power, 2; water-rights, 2; miscellaneous, 6. There were 21 separate construction projects carried out under supervision, classified as follows: irrigation, 16; water supply, 3; sewage disposal, 1; electric light and power, 1. The total cost of these improvements was about \$44,000.

A more detailed description of this co-operative work will be found in the separate report of this service.

WATER RESOURCES INDEX INVENTORY

The Index Inventory system for recording and collating the water resources data of the Dominion has been in actual use for a number of years and has provided a most efficient method for the referencing, analysis, standardization, and filing of all data relating to the subject of water resources. A detailed description of the system appeared in the annual report for 1916-17 and in the combined reports for the years 1917-18-19.

The system has been applied to practically all phases of the work carried on by the service, among the more outstanding of which may be mentioned the complete census of developed water-power, the analysis of central electric station activities, undeveloped water-power resources, stream measurement activities, and storage investigations.

This work has been largely carried on in co-operation with provincial organizations, notably the Hydro-Electric Power Commission of Ontario, the Quebec Streams Commission, the British Columbia Water Rights Branch, the Nova Scotia Power Commission, and the New Brunswick Electric Power Commission. The data compiled are being continually revised in accordance with the most up-to-date information and, resulting from a number of years of effort, a very large amount of information in standardized form is now available.

WATER-POWER RESOURCES OF CANADA

The most recent analysis places the available water-power throughout the Dominion at 20,347,400 horse-power for conditions of ordinary minimum flow and 33,617,200 horse-power ordinarily available for six months of the year. This analysis takes account of every known rapid, fall, and power site, but cannot be taken as final because there are, particularly on the northern rivers, rapids and falls concerning which there are insufficient data upon which to base estimates of power. In addition, there are opportunities of securing economic heads on rivers of gradual gradient, or possible storage and diversion opportunities, which cannot be appraised until detailed field surveys have been made. Nevertheless, the figures given above probably approximate fairly closely the power available under the conditions of flow stated.

The power ordinarily available for six months of the year may be taken as indicating approximately the combined commercial capacities of the various sites, on the assumption that any deficiency during the remaining six months can be made up from the storage of excess waters, or by the installation of auxiliary fuel power equipment. That this assumption is quite conservative is demonstrated by a study of the power development which has already taken place in Canada, for this reveals that the turbines actually installed in Canada exceed by 30 per cent the six months' power capacity of the developed sites and this installation has already proved to be good commercial practice. If, therefore, the turbine installation continues at the same ratio the present recorded resources will justify an ultimate installation of about 43,700,000 horse-power.

On January 1, 1930, the total turbine installation in Canada had reached 5,727,162 horse-power which, according to the argument just outlined, means that the installation amounts to a little more than 13 per cent of the ultimate capacity and already represents a capital investment of almost \$1,302,000,000 for generation, transmission, and distribution.

An analysis of the present installation indicates that:—

- (1) 4,817,486 horse-power, or 84.1 per cent of the total, is installed in central electric stations for general distribution.
- (2) 578,826 horse-power, or 10.1 per cent, is installed in pulp and paper mills which, in addition, use power purchased from the central electric stations to the extent of approximately 860,000 horse-power, making a total of about 1,439,000 horse-power used in this industry.
- (3) 330,850 horse-power, or 5.8 per cent, is installed in general industrial enterprise, for electro-chemical reduction, mining, manufacturing, lumbering, flour milling and other purposes.

The installation of 584 turbine horse-power per 1,000 population compares very favourably with the installation in other countries and, in an age where the use of mechanical power in industry so largely affects the value of output per worker, makes a substantial contribution to the prosperity of the Dominion as a whole.

The year 1929 saw no slackening in the water-power field; approximately 378,000 horse-power of new installation was brought into operation, whilst the installation of over 3,000,000 horse-power is in active prospect, of which more than one-half is actually under construction. Of the new installation 36,000 horse-power was accounted for by the Ghost development on the Bow river, completed by the Calgary Power Company under interim licence from this department, whilst of the three other developments under construction in the Prairie Provinces under similar licences, that on the Churchill river in Saskatchewan is nearly completed and construction operations at Seven Sisters and Slave Falls on the Winnipeg river are now in full swing.

CENSUS OF THE CENTRAL ELECTRIC STATION INDUSTRY

The generation of electricity for public distribution through the medium of the central electric station industry constitutes the leading use to which Canada's hydraulic development is put. In the year 1900, when electricity was just beginning to come into common use, some 32 per cent of the Dominion hydraulic installation was in central electric stations. Ten years later the percentage had almost doubled (61 per cent), while by 1920 over 71 per cent was devoted to this purpose, growing to over 84 per cent by the end of the year 1929. A number of factors contribute to this continual growth, notably the extensive economic radius of modern electrical transmission combined with the fortunate location of water-powers in relation to centres of population and industry without adequate local fuel supplies. The special adaption of hydraulic power to the operation of central electric stations is emphasized by the fact that for the calendar year 1928, the latest for which definite figures are available, over 98.5 per cent of the electricity generated for sale in Canada originated in the energy of her waterfalls.

The foregoing facts are indicative of the close relationship existing between water-power development and the central electric station industry and are stated as premising the necessity of the annual revision of all basic data relating to the central station industry as a contributory medium to maintaining up-to-date records of our water-power resources.

This revision is made through the agency of the census of the central electric station industry conducted annually by this service in co-operation with the Dominion Bureau of Statistics of the Department of Trade and Commerce, the assistance of the Hydro-Electric Power Commission of Ontario, the Quebec Streams Commission, the New Brunswick Electric Power Commission, the Nova Scotia Power Commission, the Manitoba Power Commission, and other federal and provincial authorities.

The statistics resulting from this annual census are presented to the public through the medium of the annual reports of the Bureau of Statistics, while at longer intervals, depending upon the varying conditions in the industry, a complete directory showing the investment in plant and equipment, installation, mechanical equipment, service, power for sale, rates, and transportation facilities of the individual central electric stations dealt with collectively in the statistical reports of the Census Bureau, is compiled and issued by this service. The first edition of this Directory was issued in 1919 in order to meet the frequent inquiries for detailed information relative to power supply, and the demand for copies was so great that the issue was soon exhausted. Rapidly changing conditions in the industry, and repeated requests for the publication of a new edition, led to a revised edition being issued as of November 1, 1922. Even greater changes taking place in the industry in the period since the publication of the second Directory and a growing demand for up-to-date information, necessitated the issuance of a third edition of the Directory in May, 1929.

DOMINION HYDROMETRIC SURVEY

The Dominion Hydrometric Survey embraces stream measurement work throughout Canada. The records are brought together in one central agency, which attends to the compilation and dissemination of stream flow data, and the survey operates efficiently both as regards office administration and field operations.

In the Prairie Provinces the survey is the direct responsibility of the Dominion Government and in the other provinces the survey is carried on by the Dominion Government under co-operative agreements with the provinces concerned. The Dominion is divided into major drainage divisions, which, together with the district office or offices in charge, are as follows: Pacific drainage, Vancouver; Arctic and Western Hudson Bay drainage, Calgary and Winnipeg; St. Lawrence and Southern Hudson Bay drainage, Ottawa and Montreal; Atlantic drainage, Halifax.

The uses to which the records are put are primarily in connection with water-power development and irrigation projects, and the rapid strides which have taken place in the hydro-electric field are due in no small part to the detailed and extensive records of the regimen of the numerous lakes and rivers of the country which have been made available, by the Dominion Hydrometric Survey, assisted by the voluntary co-operation of the provinces, of private corporations, and of numerous individuals.

Run-off Conditions in Canada.—As set forth in detail in the annual reports of the District Chief Engineers, the average run-off for the year has been generally below average in the Pacific, Arctic and Western Hudson Bay, Southern Hudson Bay, and Atlantic drainages, and above normal in the St. Lawrence drainage.

In the Pacific drainage typical stations showed a range in run-off for the fiscal year from 78 per cent of the long term mean in Bridge river in the Central Fraser River basin to 84 per cent of the long term mean in the Kootenay river at Wardner.

In the Arctic and Western Hudson Bay drainage, typical stations showed a range in run-off for the fiscal year from 6 per cent of the long term mean in Moosejaw creek in southeastern Saskatchewan, to 92 per cent of the long term mean in the Elbow river in central Alberta. In the first week of June torrential rains over the foot-hill areas west of Calgary caused serious flood conditions, and new maximum discharges were recorded in the Bow, Elbow, and Ghost rivers.

In the St. Lawrence and Southern Hudson Bay drainage, typical stations showed a range in run-off for the fiscal year from 88 per cent of the long term mean in the North Maganatawan river, at Burk's Falls, Ontario, to 126 per cent of the long term mean in the Grand river at Galt, Ontario.

In the Atlantic drainage, typical stations showed a range in run-off for the fiscal year from 93 per cent of the long term mean in the Miramichi river in northern New Brunswick, to 107 per cent of the long term mean in the St. Mary river in eastern Nova Scotia.

POWER AND STORAGE INVESTIGATION

During the year only such power and storage investigations involving field studies were undertaken, as were made necessary by requests of organizations receiving co-operative assistance from the service, or by reason of special circumstances. Office studies were continued in the re-analysis and keeping up to date of the records of undeveloped and developed water-power resources in all parts of the Dominion.

In British Columbia an intensive study of the hydraulic features of the Kootenay drainage from the international boundary to a point several miles below Nelson, was continued with special attention being given to the flow in the west arm of Kootenay lake. Co-operative investigations were carried out with a number of hydro-electric organizations in connection with power possibilities on such rivers as the Bridge, Shuswap, Nascall, Dean, Kootenay, Elk, Bull, and a number of streams in the Prince Rupert district, and also on the Campbell and Nimpkish rivers on Vancouver Island. Co-operation was also continued with the city of Vancouver in connection with nearby power streams, with the Greater Vancouver Water District in studies of a metropolitan domestic water supply for the Greater Vancouver area, and with the Vancouver and Districts Joint Sewerage and Drainage Board's investigations. Hydraulic studies were continued of the Fraser river at Hell's Gate, and of the Bridge River canyon at the request of the Department of Marine and Fisheries.

In Alberta a resident inspecting engineer was maintained throughout the construction of the Ghost development on the Bow river, undertaken by the Calgary Power Company under the terms of an interim licence issued by the department. Inspections were made of a number of extensions to the system of the Calgary Power Company in the territory between Calgary and Edmonton, and co-operation was also afforded the company in the investigation of power and reservoir sites in the Bow river basin. Responsibility for the operation of the Lake Minnewanka storage during the filling season was again assumed by the department with satisfactory results.

In the Northwest Territories co-operation was afforded private power interests in the investigation of power possibilities of the Hay, Taltson, and other rivers flowing into Great Slave lake.

In Saskatchewan a resident inspecting engineer was placed during the month of June on the construction of the Island Falls development on the Churchill river, being carried out by the Churchill River Power Company Limited under the terms of an interim licence issued by the department.

In Manitoba, resident inspecting engineers were allocated to look after the department's interests under the terms of interim licences, to develop power at two locations on the Winnipeg river; the first at the Seven Sisters site where construction is being carried out by the Northwestern Power Company Limited, and the second at Slave Falls where the city of Winnipeg is constructing its second development on the river. On the Roseau river a profile was made from the international boundary downstream to the vicinity of Dominion City and other topographical and hydraulic information secured in connection with the reference now before the International Joint Commission.

In Ontario a field survey, using vertical air photographs for the plotting of contours, was made of the Winnipeg river between Keewatin and Boundary falls in connection with the securing of a flowage easement, rendered necessary to permit of probable flood conditions arising from the regulation of the lake of the Woods. Assistance was again afforded the International Lake Superior Board of Control in recalibrating the discharge through the dams at Sault Ste. Marie, and on the Niagara River field, and office studies were pursued in conformity with, and in continuation of, the investigation of the Special International Niagara Board appointed to report upon the preservation of the scenic beauty of Niagara falls. Hydraulic investigations were made of the Abitibi river in the vicinity of the canyon in co-operation with the Abitibi Power and Paper Company, and work was continued in co-operation with the Ontario authorities in the re-analysis of the developed and undeveloped water-power resources of the province, in preparation for the publication of a revised list of these resources.

In Quebec special investigations were made on the St. Maurice river in co-operation with the Shawinigan Water and Power Company, in connection with storage and power development involving a future installation of over 1,000,000 horse-power. Special hydraulic work was also undertaken in co-operation with the Beauharnois Power Company in determining the discharge capacity of the St. Lawrence River channels at Valleyfield. Work was continued in systematically keeping up to date the figures of developed and undeveloped water-power resources of the province.

In New Brunswick, preliminary investigations were made for the towns of Newcastle and Chatham of the cost of developing power at the White Rapids site on the Miramichi river, and special hydraulic studies were carried out at the Great Falls plant of the Bathurst Power and Paper Company on the Nipisiguit river, from which convenient rating curves were prepared.

In Prince Edward Island an investigation was made of a proposed development on the Dunk river near tidewater, with a view to augmenting the supply of power to the town of Summerside; also field studies were made and a report prepared for the village of O'Leary in connection with a proposal to develop power on Mill river.

In Nova Scotia special investigations were made for the Nova Scotia Power Commission in connection with the North East river below Pockwock lake, and the proposed Ingram River-St. Margaret's Bay diversion. Studies were also made, for other organizations, of the Sackville and Herbert rivers. Assistance was given to the Avon River Power Company in connection with its development on the Black river, and to the Chester Light and Power Company in the installation of a new unit in its plant situated on the East river near Chester.

IRRIGATION

Climatic conditions during the early part of the year 1929 were very favourable from an agricultural standpoint, precipitation being sufficient to render soil conditions satisfactory for seeding and germination. Throughout

July and August high temperatures and lack of rainfall caused conditions unfavourable to the growth of non-irrigated crops. Ideal harvesting conditions prevailed until snow fell in early November.

Reclassification of lands in the major projects was continued together with studies of more efficient irrigation methods, including seepage and alkali problems, investigations at the Brooks "Duty of Water" Experimental Station and co-operative studies with the Department of Agriculture. Data were secured relative to the influence of commercial fertilizers on the water requirements, maturity and quality of sugar beets, grains, and alfalfa.

WATER ADMINISTRATION

During the calendar year 1929 there were 36 water licences issued under the provisions of the Irrigation Act and 100 applications for such licences were received. Fur-farming licences to the number of 172 were granted to the provinces of Alberta and Saskatchewan for the use of lakes and other bodies of water for fur-farming purposes, and 63 additional applications for such rights were received. At the end of the year there were 1,062 water licences, 348 fur-farming licences, 22 temporary permits, and 169 authorizations recorded in the department with, in addition, 230 projects under investigation as well as 465 applications for fur-farming privileges.

INSPECTION WORK

Routine field work in connection with the administration of the Irrigation Act, comprising investigations of new applications, surveys, preparation of plans and inspection of operating projects, was continued, together with canal and stream measurements and the study of seepage losses. Field engineers engaged on this work inspected 621 established projects, investigated and surveyed 70 new projects, made 2,084 gaugings of stream and canal discharge, and carried out the usual annual inspections of the major projects and irrigation districts.

GENERAL RIVER CONTROL

Field investigations were made and reports submitted as to flood conditions on the Elbow, Bow, and Highwood rivers. The run-off occurred during the latter part of May and early June and little trouble with floods was experienced after that period.

MAJOR IRRIGATION PROJECTS

Canadian Pacific Railway, Western Section.—During the season 37,390 acres were irrigated, a considerable increase over the previous season. The total cropped area was 223,900 acres, producing crops valued at \$1,707,500, based on the average values in the irrigation districts and representing a per acre return of \$7.63; 17,000 acres of irrigated land were seeded to wheat and produced an average of 10.7 bushels per acre.

Canadian Pacific Railway, Eastern Section.—The acreage irrigated during the season was 78,610, being an increase over the previous season of some 32,930 acres. The total cropped irrigable area was 70,590 acres, of which 34,750 acres were seeded to wheat. No crop returns are available for 1929.

Canadian Pacific Railway, Lethbridge Section.—The irrigated acreage in crop was 18,650, while the total cropped area was 57,850 acres. The total return from the cropped area was \$1,977,300. The major crop was wheat, which represented 58 per cent of the cropped area and produced an average of 28.8 bushels per acre on the irrigated land and 26.4 bushels per acre on the non-irrigated area.

Taber Irrigation District.—The area actually irrigated was 10,090 acres, an increase over the previous season of some 6,920 acres. The total cropped area was 19,900 acres, producing \$606,682, or a per acre return of \$30.48. The principal crop was wheat, representing 46 per cent of the cropped area on irrigable land. The sugar beet area was 3,520 acres, an increase over the previous season of 1,250 acres. The average yield was 8.1 tons per acre and the saccharine content of the beets from all areas averaged 18.2 per cent. The guaranteed price for this crop by the sugar company is \$7.50 per ton.

Canada Land and Irrigation Company.—This company disposed of 1,500 acres during the year and reclassified an additional 6,400 acres. The total area of irrigable land sold is approximately 29,700 acres and, with the 4,500 acres of irrigable land in the New West District, makes a total of 34,200 acres served with water by the company. The acreage irrigated was 25,910 acres, an increase over the previous season of 10,230 acres. The total cropped area was 24,145 acres, producing \$501,240, or equal to a per acre return of \$20.75. The area in wheat was 18,110 acres, producing 321,480 bushels, or 17.7 bushels per acre.

New West Irrigation District.—The area irrigated in this district was 3,180 acres and the total area under crop was 4,180 acres, producing \$59,190, or a per acre return of \$14.16. The major crop was wheat, which represented 80 per cent of the total irrigable area, and yielded an average of 11.6 bushels per acre.

Lethbridge Northern Irrigation District.—An area of 61,230 acres was irrigated in 1929, an increase of 27,790 acres over that served in 1928. The total cropped irrigable area was 61,230 acres, producing \$1,800,000, or a per acre return of \$29.40. The wheat crop amounted to 1,700,000 bushels. No detailed crop census was made during the past season and the above figures were estimated by the district officials. There were thirty new settlers taking up 4,800 acres of land.

United Irrigation District.—The area irrigated was 3,100 acres, while the total cropped area was 29,570 acres, producing \$723,666, or a per acre return of \$24.45. On the irrigated land the area in wheat was 172 acres, producing 5,415 bushels, or a per acre return of 31.4 bushels. The area in wheat on land not irrigated was 20,260 acres, yielding a per acre return of 21.9 bushels.

Magrath Irrigation District.—Some 4,000 acres, or 57.3 per cent of the total irrigable area, was served with water in 1929, but no crop returns are available from this district.

Raymond Irrigation District.—No crop census returns have been submitted by this district, which is supplied with water through the works of the Canadian Pacific Railway Company's Lethbridge section. This (1929) was the third year of operation and the total irrigable area in this district is some 15,130 acres.

Little Bow Irrigation District.—This district, comprising a number of small individual pumping units, diverts water from the Highwood river at the town of High River. The diversion works connecting the Highwood river with the Little Bow river were constructed in 1923, but to date none of the individual schemes have been installed.

Mountain View Irrigation District.—Authorization for the construction of the works was issued in June, 1925, and, although work is proceeding, the project has not yet been completed.

ALKALI TEST PLOTS AT MAPLE CREEK, SASKATCHEWAN

These experimental plots have been carried on for eight years to obtain some reliable data regarding the effect of irrigation on heavy soils with high alkali content. It is proposed to continue the experiments over a further period of two years. No appreciable change has appeared in the fertility of the soil since the inception of this investigation. Results to date in growing wheat have not been satisfactory, but the existing data indicate that alfalfa will in time build up a soil suitable for wheat. At no time has alkali appeared on the surface of the plots.

DUTY OF WATER INVESTIGATIONS

The new projects started on the Brooks "Duty of Water" Experimental Station in 1928 were continued in 1929. The irrigation experiments included time of irrigation and seasonal use of water studies with wheat, oats, barley, corn, sugar beets, potatoes, sweet clover and alfalfa; total water requirements of sugar beets, beans, alfalfa seed and fall wheat; a comparative study of three soil improvement crops including alfalfa, red clover, and sweet clover; superphosphate tests with wheat and several fertilizer tests with beans, alfalfa seed, corn, and sugar beets. The main controlled factor in these tests was moisture, either natural or applied by irrigation, and in some cases rotation received consideration. Rainfall in this district, except for the early part of the season, was scanty, and the crops were greatly benefited by the application of irrigation water.

A complete report of the 1929 irrigation investigations at Brooks is contained in a separate report of this service.

IRRIGATION EXTENSION WORK

Extension work among the sugar-beet growers of southern Alberta was carried on to secure a more economical use of irrigation water. In each district from three to five beet moisture tests were made every week or ten days during the growing season. At the conclusion of each test or inspection trip, the data secured relative to moisture conditions and irrigation requirements of each field were supplied to sugar company officials, project managers, and beet growers. This information was also published in the local newspapers. The results obtained from this work in 1929 were very encouraging, more farmers each year following the recommendations made as a result of these periodical soil moisture observations. A larger proportion of the beet acreage was irrigated during 1929 than in other years. The summer of 1929 was the driest since the sugar factory has been in operation, but the tonnage harvested was approximately 50 per cent greater than that of the previous year.

DRAINAGE SURVEYS AND INVESTIGATIONS

Under the provisions of the Irrigation Act the control of the surface waters in the provinces of Alberta and Saskatchewan and in the northern part of Manitoba is vested in the Crown in the right of the Dominion. Likewise the unalienated lands in these provinces are under Dominion control. On the other hand, the control of drainage is the responsibility of the provinces. To avoid the complications which were inevitable in the attempt to administer drainage under such conditions of divided jurisdiction, the provinces of Alberta and Saskatchewan entered into a drainage agreement in 1917 with the Dominion Government whereby the procedure looking to the development of drainage

schemes and the purchase of Dominion land reclaimed thereby was greatly simplified. This agreement was subsequently ratified and implemented by the reclamation acts and the drainage regulations of the three governments affected.

For the purpose of administration, drainage is dealt with under three major divisions, viz., small or private schemes, provincial, and Dominion schemes.

SMALL PROJECTS

In Alberta and Saskatchewan settlers may undertake drainage schemes where the area included does not exceed 1,280 acres and when the estimated cost is not in excess of \$5,000. The Department of the Interior furnishes the necessary engineering service free of charge. Sales of reclaimed Dominion land are made at the minimum rate of \$1 per acre. The settlers assume the cost of the reclamation works.

The year 1929 was exceptionally dry and conditions were therefore very favourable for construction work, but unfortunately, some settlers whose schemes had not been completed in accordance with the plans filed, erroneously considered that the required degree of reclamation had been obtained following the temporary lowering of the water-table due to subnormal precipitation conditions, and did not carry out the further necessary work.

Satisfactory crops were harvested on the reclaimed lands, 6,000 tons of hay and fodder being obtained from the schemes in the vicinity of Edmonton, Alberta.

During the year 74 small schemes were inspected, 24 new applications for schemes dealt with, 5 schemes authorized, 2 sales of Dominion lands made, and 15 applications cancelled.

LOW WATER LAKE DRAINAGE PROJECT

The Low Water Lake drainage project, comprising 7,840 acres, situated in townships 50 and 51, ranges 4 and 5, west of the 5th meridian, in Alberta, was authorized prior to 1917, which accounts for the fact that as a private scheme it exceeds the existing size limitation with regard to such schemes. During the past year ten miles of catch-water ditches were constructed in connection with this project, for the purpose of intercepting drainage water from the tributary drainage basin, and preventing the reflooding of the former lake bed which was unwatered several years ago. Thus, pending the completion of additional drainage works, about 1,500 acres of land are protected to a considerable extent and rendered productive.

PROVINCIAL PROJECTS

These drainage schemes are generally quite large and affect a considerable number of settlers. They are organized under the provincial drainage acts and comprise districts in which most of the land affected is privately owned. The construction funds are raised by the sale of debentures which are secured by the assets of the settlers whose lands are included. The debentures are retired ultimately by a fund realized through annual contributions in the form of drainage taxes by the settlers in the scheme. The taxes are proportionate to the benefits resulting to the lands through drainage.

Dominion lands reclaimed by these schemes are sold to the provinces at the rate of \$1 per acre. These lands are resold and the proceeds applied to reduce the drainage taxes.

In Alberta five such schemes have been carried out, while in Saskatchewan twenty-six have been completed.

Owing to the dry conditions of the past year, there was little demand for comprehensive drainage. In Saskatchewan, however, Mildred Drainage District No. 29 was completed at a cost of \$11,000, and the Yellow Grass Drainage District ditches were cleaned out and improved at a cost of \$50,000. The

possibility of forming a provincial drainage district in the vicinity of Kronau, Saskatchewan, was investigated, but it was found not to be economically feasible. Apart from the usual maintenance work in connection with the existing schemes, no new provincial projects were carried out in Alberta.

DOMINION PROJECTS

When more than 50 per cent of the area in a proposed scheme is unalienated land the Dominion Government may undertake the drainage work. In such cases the entire cost of the project is borne in the first instance by the Dominion, the cost being recouped subsequently by the sale of the reclaimed Dominion lands. One scheme was carried out some years ago in the province of Saskatchewan. During the past year no new projects of this character were undertaken.

MANITOBA DAIRY FARMS LIMITED

There is no drainage agreement between the Dominion and the province of Manitoba. Any schemes in Manitoba, affecting Dominion interests, are dealt with by direct negotiations between the two Governments.

Western Project.—The Manitoba Dairy Farms Limited obtained a lease in 1927 of 9,700 acres of Dominion land in townships 4 and 5, range 9, east of the Principal Meridian, for reclamation by drainage. During the past year the company constructed additional ditches and carried on operations in connection with the clearing of the reclaimed land. Inspections of the project were made from time to time by engineers of the department in conjunction with officers of the provincial Government.

Eastern Project.—This scheme, situated in townships 3 to 10, ranges 9 to 14, east of the Principal Meridian, is still in the preliminary stage and has not yet been authorized by the provincial and Dominion governments.

ROSEAU RIVER FLOOD PREVENTION AND RECLAMATION PROJECT

With the object of devising a scheme to prevent flooding and to furnish adequate drainage facilities in the Roseau River drainage basin in Canada, a field investigation was carried out in the season of 1929 in the area contained in townships 1 to 3, ranges 6 to 14, east of the Principal Meridian. Topographical data were obtained, levels run for 967 miles and 81 square miles plane-tabled. Soundings were taken of all swamps affected, hydrometric records systematically continued, and soil samples collected from the lands susceptible of reclamation. Numerous cross sections were made of the Roseau river between the international boundary and its mouth. Maps of the area investigated are now under preparation and will show, in addition to the principal physical features and the limits of the watershed, contours to two- and five-foot intervals, the former for the lands subject to direct flooding from the Roseau river. When the maps are completed flood remedial and drainage schemes will be projected and designs and cost data prepared in detail.

FUR FARMING

Agreement was reached between the provinces of Alberta and Saskatchewan and the federal Government as the result of which vacant and available Dominion lands containing marsh and water areas suitable for fur-farming purposes are leased to these provinces free of charge. These lands then become available for re-leasing by the provinces under their regulations in that regard. During the past year ninety-four leases were issued by the department for an area of 33,346 acres. The total area covered by the leases issued to date is 184,930 acres.

VI

NORTH WEST TERRITORIES AND YUKON

REPORT OF THE DIRECTOR, O. S. FINNIE

GENERAL

Not since the days of the Klondike gold rush has there been so much interest manifested in Northern Canada as during the past fiscal year. Many factors have combined to create this attitude in the public mind. The general northward trend of development has rolled back the Canadian frontier beyond the provincial boundaries. The amazing strides accomplished in the use of aircraft for exploration and mineral prospecting have made possible the reaching of regions heretofore practically inaccessible. The revival of Arctic and Antarctic exploration; the proposals to establish international air routes between Europe and America by way of Greenland and other Arctic islands; and the quest for northern furs, minerals, and other natural resources have aroused a widespread desire for greater knowledge of our far northern possessions.

It is the responsibility of the North West Territories and Yukon Branch to meet the public need in this respect, and to carry out the governmental policy of broader development activities. Its work, consequently, has been greatly increased in scope. In administration, exploration and dissemination of knowledge, the Branch has had an unusually active year. The scope of its work embraces all Department of the Interior matters, with the exception of mining, pertaining to the Northwest Territories and Yukon.

Wild Life Division.—The work of this division is carried on under two sub-divisions. One deals with the administration of the *Northwest Game Act* and the native game preserves, and the other with the administration of the *Fur Export Tax Ordinance*, and the payment of wolf and coyote bounties. A summary of the year's activities in these connections is contained in a statement appearing in the section devoted particularly to the Northwest Territories.

Lands and Records Division.—The work of this division has to do with the administration of Crown lands and timber in Yukon and Northwest Territories. A considerable amount of Branch correspondence was handled during the year by this division. Particulars regarding disposal of lands and timber are shown separately for the Northwest Territories and Yukon, in paragraphs that follow under their respective headings.

Engineering Division.—The office work of this division consisted largely of consolidating the field notes obtained by the various explorers and investigators employed in northern research, and the compiling and drafting of maps, charts, sketches, and weather charts for publication. Survey field notes were also calculated, checked, and plotted; buildings and boats were designed and drafted; areas calculated and technical descriptions of lands prepared, including descriptions of the mining divisions of the Northwest Territories. There was also the distribution of maps for publicity purposes, plotting leases and homesteads in Yukon Territory, and the preparation of licences for trading posts and for scientists and explorers, and of commissions for coroners, justices of the peace, and notaries public.

Supplies.—During the past year complete building material, equipment and supplies for doctors' residences at Aklavik, Coppermine, and Chesterfield were selected, requisitioned, and shipped. Specially designed boats for northern travel were secured also. Considerable supplies and equipment were furnished to mission schools and hospitals throughout Mackenzie District.

Library and Museum.—The Branch is gradually building up a very extensive and valuable Arctic library consisting of books, photographs, coloured lantern slides, and reels of motion picture film. It is accumulating also a collection of mineral, botanical, and other natural resources specimens drawn from Yukon and the Northwest Territories gathered principally by its own field officers. To this collection are being added many typical specimens of native workmanship—both Indian and Eskimo—in skins of animals, ivory, and other material, as well as relics of early exploratory expeditions and articles of archaeological and ethnological interest.

The library at the end of the year contained about 900 volumes, nearly all relating to Arctic exploration and development. Some of these works are original editions long since out of print and are very valuable and useful. During the year about thirty books were added. The library contains also over 7,000 photographs (of which 1,329 were added during the year), 1,000 coloured lantern slides, and a few reels of motion picture film. One of these reels is a very excellent motion picture of a band of musk-oxen on their native grazing grounds on Devon island, Eastern Arctic. It was secured by the Branch's photographer who accompanied the Annual Arctic Expedition of 1929.

FIELD INSPECTION BY THE DIRECTOR

During the year a field inspection of the Mackenzie District and of Yukon Territory was made by the Director of the Branch, Mr. O. S. Finnie. The many changes taking place in the North demand constant revision of administrative matters and policy, and the Director's trip was for the purpose of securing first-hand information of these changes and of discussing personally with various local spokesmen the advantages or disadvantages of certain proposed or requested changes in administration.

The Director left Ottawa on July 13, and travelled by rail via Edmonton, to the end of steel at Waterways, Alberta, thence by steamboat down the Athabaska and Slave rivers to Fitzgerald, from which point a sixteen-mile motor trip took him across the portage to Fort Smith, headquarters for the Government in the Northwest Territories.

Mackenzie Inspection.—From Fort Smith Mr. Finnie proceeded down the Mackenzie river by steamboat, visiting all settlements along the way as far as Aklavik. At each point of call frank discussions of the merits of new laws and suggested laws were encouraged, and careful notes were made of the suggestions offered by residents.

Flight from Aklavik to Dawson.—Having completed investigations in the Mackenzie valley, Mr. Finnie travelled by aeroplane from Aklavik to Dawson where inspection of affairs in Yukon Territory was commenced. This flight was an epochal one in the North, pioneering flying operations between the Mackenzie and the Yukon. The route followed was the old Mackenzie-Yukon route of Klondike days. From the Mackenzie delta the plane went by way of the Rat river to the Richardson mountains, crossed these mountains by way of McDougal pass and then followed the Bell and Porcupine rivers to Fort Yukon, Alaska, from which place the Yukon river was followed in an up-stream direction to Dawson. The trip was made in a single non-stop flight of six and one-half hours. The total distance flown was about eight hundred miles. The significance of

aerial transportation in the North may be realized when it is recalled that a month was formerly considered good time for making this trip by canoe and steamboat.

Yukon Inspection.—Inspections in Yukon Territory were continued at Mayo, Keno, Carcross, and Whitehorse. Again the aeroplane was used with remarkable time-saving advantages in travelling between Dawson and Mayo, and between Mayo and Carcross. Many matters of vital interest were discussed at points of call.

The Director returned by way of the Pacific coast and Vancouver, reaching Ottawa on September 20. The whole trip involved nearly 9,000 miles of travel.

PUBLICATIONS

To meet the demand for information respecting Government activities in the Yukon and Northwest Territories as well as for authentic data concerning their resources, climate, and other phases, the Branch issued during the year a number of publications. These, with a single exception, were written by its own officials who have had wide experiences in research and actual field investigations. Included are original reports of specific explorations and field examinations. The publications prepared and issued during the fiscal year were:—

Yukon—Land of the Klondike.—A 48-page, profusely illustrated booklet, with cover in colours, setting forth the attractions of the Yukon as a tourist objective and summarizing its resources. (Two editions).

The North West Territories, 1930.—A 137-page pamphlet with illustrations and maps, being a concise compendium of the Department's most accurate information on the extent, topography, population, resources, climate, transportation facilities, and Governmental organization of the Northwest Territories.

Reindeer Grazing in Northwest Canada.—A 46-page pamphlet, with illustrations and map, being the report of an investigation of pastoral possibilities in the area from the Alaska-Yukon boundary to the Coppermine river.

Southern Baffin Island.—A 130-page pamphlet, with illustrations and maps, being an account of exploration, investigation and settlement during the past fifty years on the southern part of Baffin island.

Discovery of the Breeding Grounds of the Blue Goose, 1929.—A short account, illustrated, of the discovery of the breeding grounds of the blue goose on Baffin island.

Coronation Gulf Copper Deposits.—A short report, illustrated, of an inspection during the year 1928-29, of the known mineralized areas in Coronation Gulf and Bathurst Inlet districts.

Preliminary Report on the Aerial Mineral Exploration of Northern Canada.—A 32-page pamphlet, with illustrations and maps, dealing briefly with the aerial operations of 1928 and 1929 and the added knowledge of the country obtained through these activities.

Regulations Respecting Game in the Northwest Territories.—A 44-page pocket bulletin containing information respecting game laws, wolf and coyote bounties, and the fur export tax.

These publications have proved exceedingly popular. A 15,000 edition of the Yukon booklet was quickly exhausted and a second edition of 15,000 was issued. Many requests were received for more complete reports of field investigations and the preparation of a number of these was begun.

In addition to the above mentioned publications, a number of articles dealing with explorations and developments in the North were prepared for publication in various scientific journals and for lecture purposes.

NORTHWEST TERRITORIES

NORTHWEST TERRITORIES COUNCIL

Personnel of Council.—The Northwest Territories Council is constituted as follows:—

Commissioner—W. W. Cory, C.M.G., Deputy Minister, Department of the Interior.

Deputy Commissioner—R. A. Gibson, Esq., Assistant Deputy Minister, Department of the Interior.

Members of Council—Charles Camsell, LL.D., Deputy Minister, Department of Mines; O. S. Finnie, B.Sc., Director, North West Territories and Yukon Branch, Department of the Interior; H. H. Rowatt, Esq., Dominion Lands Board, Department of the Interior; D. C. Scott, Litt. D., Deputy Superintendent General, Department of Indian Affairs; Colonel Cortlandt Starnes, Commissioner, Royal Canadian Mounted Police.

Meetings of Council.—During the year seven meetings were held. At these a number of important matters were dealt with, including the redrafting of the game regulations, the consideration of grants for the protection of native orphan children and for assisting the carrying on of hospitals and schools, the establishment of permanent radio stations, and the organizing of a system of fire-rangings and game protection by wardens. New ordinances concerning the fur export tax, legal time zones in the Territories, and Eskimo ruins were passed, and careful consideration given to the draft of the Revised Ordinances of the Northwest Territories.

ANNUAL ARCTIC EXPEDITION

The annual patrol by ship to the Arctic archipelago was carried out. The expedition sailed on the ss. *Beothic* from North Sydney, Nova Scotia, on July 20, having on board 44 persons in all, 36 officers and crew and 8 members of the expedition. In addition to the usual quota of supplies for the northern posts the ship carried building material for the construction of a residence and warehouse for the medical health officer at Chesterfield.

Members of Expedition.—The members of the expedition comprised Mr. G. P. Mackenzie, Officer in Charge; R. S. Finnie, Secretary; Mr. P. A. Taverner, Ornithologist of the National Museum staff; Dr. H. A. Stuart, Medical Officer of the Department; and four constables of the Royal Canadian Mounted Police, going North to relieve others coming out at the end of their tour of duty. Captain E. Falk, was Ship's Master and Captain L. D. Morin was Ice Pilot.

Call at Godhavn, Greenland.—The expedition reached Godhavn, North Greenland, on the morning of July 27. Godhavn, the capital of North Greenland, is an interesting settlement. The Danish officers here extended every kindness and courtesy to the members of the expedition. Acting Governor Berthelsen with Mrs. Berthelsen and other prominent Danish officers conferred with the Officer in Charge on matters of mutual interest in the North, and dined on the ship. A continuous moving picture show of pictures taken on the previous voyage of the *Beothic* was given for the entertainment of the members of the colony.

Supplies Landed at Dundas Harbour.—The expedition left the same evening for Dundas harbour, the next port of call. The ice conditions in Baffin bay were more favourable than in former years so that, without undue incident, the anchor was dropped in Dundas harbour at 11 p.m. of the 30th. All were well at the post. It was learned that Inspector A. H. Joy, had made this detachment his headquarters for the year. On March 12, accompanied by

Constable Taggart and the Eskimo, Nookapiungwah, he had left on a long patrol to Melville island and had not since been heard from. The Inspector, however, had left word at the post that if he had not returned to Dundas Harbour at the time the ship arrived he would be either at Craig Harbour or Bache Peninsula.

Moving Pictures of Musk-oxen.—By noon of July 31 all freight was landed and departure was taken for Craig Harbour. As the weather was fine and clear, on coming into Jones sound it was decided to proceed to cape Sparbo on the north side of Devon island for the purpose of securing moving pictures of musk-oxen known to be in that vicinity. At 7.30 on the morning of August 6 the anchor was dropped five miles off cape Sparbo, which is as near as a ship can approach on account of dangerous shoals. A party went ashore in the motor-boat and pictures of the musk-oxen were secured.

Supplies for Bache Peninsula Landed.—On the evening of the same day the expedition reached Craig Harbour, only to learn that Inspector Joy and his party had not reached that post. Departure was taken immediately for Bache Peninsula. An effort was made to take the ship through Glacier strait, only to find the eastern end of the strait blocked with ice, necessitating returning and going around the southern side of Coburg island. Much heavy ice was encountered in Smith sound south of the Cary islands. North of these islands, however, more open water was encountered until in the vicinity of Rice strait, when very heavy ice was again met with.

The anchor was dropped in Fram haven in the early morning of the 3rd. Inspector Joy and party, as well as Corporal E. Anstead and the two constables of the Bache Peninsula detachment, were here awaiting the arrival of the ship. All were well. The inspector had made a very successful patrol. The police reported that ice conditions in Buchanan bay were such that it would be impossible to reach the post with the ship. An investigation by the ship's officers confirmed this view. It was, therefore, decided to land the supplies for Bache Peninsula at cape Rutherford, which is on the south shore of Buchanan bay and about twenty miles from the post. The transfer of the supplies by motor boat, if conditions later in the season permitted, and if not, by dog-team in the winter, presented no very difficult problem for the police at the detachment, well equipped as they are for either means of transport.

All supplies were safely landed and the anchor weighed in the early morning of the 4th. The return was made around the north of Pim island. Fog and ice conditions made the passage across to Etah difficult. It was the intention to land here Dr. H. K. E. Krueger and his assistant, Mr. A. R. Bjare. Dr. Krueger is a distinguished German scientist who, by arrangements previously made, was transported on the *Beothic* from Godhavn to Etah. The few native families that usually make their headquarters at Etah had gone south to Robertson bay. Dr. Krueger and his assistant were, therefore, put ashore at Nerik settlement in Robertson bay on the afternoon of the 4th and departure was taken immediately for Dundas Harbour.

Return to Pond Inlet.—The passage south to Dundas Harbour was rendered particularly difficult because of dense fog and snow squalls. Dundas Harbour, however, was safely reached at noon on the 6th. Shortly after midnight the ship was again under way for the next port of call, Pond inlet, which port was reached at midnight of the 7th after a rather stiff contest with the ice in Eclipse sound. All were well at the post. Unloading was started shortly after the anchor was down and was carried on with considerable difficulty on account of the ice which was then moving in great quantities down the inlet to the open sea.

Southern Baffin Island Posts Visited.—Departure was taken for River Clyde the evening of August 8. Almost continuous fog and very severe ice conditions for the first hundred miles south of Pond Inlet made progress slow. Numerous polar bears were seen on the ice in this vicinity, but the atmospheric conditions were such that only fair moving pictures were secured. The ship arrived at River Clyde at noon of the 10th and left again at 5 p.m. of the same day for Pangnirtung.

In making the voyage south from River Clyde it was necessary to go more than one hundred miles off the coast to avoid very heavy ice nearer the land. On the morning of the 12th the pack was cleared, but heavy ice was met again at the entrance to Cumberland gulf. Only scattered ice was in the gulf, however, and without much delay on this account the expedition arrived at Pangnirtung at 4.30 p.m. of the 13th. All were well at the post. Unloading was started the same evening and was finished at early morning of the 15th.

Departure was taken immediately for Lake Harbour. A southeast gale created a very heavy sea which breaking over the ship smashed two of the boats used for landing cargo. Because of the fog conditions it was not possible to get an observation or bearing after leaving Pangnirtung until off the Hudson strait where a bearing was obtained from the Direction Finding station at Cape Hopes Advance. Advantage was thus taken of this wonderful aid to modern navigation. The anchor was dropped at Lake Harbour at 4.30 p.m. of August 17 and unloading was started immediately. Everything was landed and departure taken for Chesterfield inlet at 2.30 p.m. of the 18th.

Call at Chesterfield.—No ice of any consequence was encountered on the run to Chesterfield. A thick fog necessitated anchoring off Chesterfield for twenty-four hours before it was deemed safe to attempt an entrance to the harbour. The anchor was dropped at 10 a.m. of September 2. All freight was landed by the afternoon of the 3rd and departure immediately taken for Lake Harbour. Mr. W. H. B. Hoare, investigator for the Department, was taken aboard at Chesterfield.

On arrival off Coats island, the weather being fine, the Officer in Charge and party went ashore in the motor boat in the vicinity of Cary's Swan Nest. Several hours were spent in this part of the island securing specimens of vegetation with a view to assisting in determining the suitability of this island for reindeer.

Mr. J. Dewey Soper, investigator for the Department, joined the ship, according to arrangements previously made, off the entrance to Lake Harbour. The voyage was continued on to Resolution island, where the Marine Department was establishing a direction finding station. The ss. *Armora* and the ss. *Sambro*, carrying equipment and supplies for that work, were at anchor at Acadia cove and Captain Hearne of the *Armora* came out in a launch to pilot the *Beothic* through the very narrow entrance to the harbour.

Return of Expedition.—At 5 p.m. of August 28 departure was taken for Port Burwell and because of the very thick fog in the strait it was not possible to make the harbour until 11 p.m. of the 29th. The freight for the post was quickly landed and the start on the last leg of the voyage home made at 7 p.m. of the same day. The last few days of the voyage home to North Sydney were uneventful, that port being reached at 9.30 a.m. of September 3.

FIELD INVESTIGATIONS

Continuation of Previous Year's Work.—On April 1, 1929, the Branch had in the field the following investigators,—Messrs. L. T. Burwash, G. H. Blanchet, W. H. B. Hoare and J. Dewey Soper. Mr. Burwash had wintered on King William island and Boothia peninsula where he had been carrying on work in

connection with magnetic observations and Eskimo investigations. Mr. Blanchet had wintered at Tavane on the west coast of Hudson bay, having been attached as observer to one of the aerial mineral prospecting parties investigating Keewatin District. Mr. Hoare had spent the winter in Thelon Game Sanctuary making investigations respecting musk-oxen and caribou, and Mr. Soper had wintered on Foxe peninsula where he had carried out extensive topographical surveys and wild life investigations.

Investigations by Mr. L. T. Burwash.—On April 1, 1929, Mr. Burwash who had wintered in the field continued his investigations in the vicinity of King William island. During April a trip was made from Gjoa haven to the magnetic pole where observations for magnetic declination, vertical dip, and total intensity were made. Other magnetic observations were made at Kent bay, cape Victoria, and Oscar bay. On May 17 the winter camp at Gjoa haven was abandoned and a trip by dog-team was undertaken with Coronation gulf as its objective. Wilmot island, which lies in the easterly section of Coronation gulf, was reached on June 16 where an examination of the copper-bearing rocks in this area was completed. A trip covering the known mineralized areas of Coppermine river was made and several deposits of native copper were examined.

Investigations by Mr. G. H. Blanchet.—During the years 1928 and 1929 Mr. Blanchet was in Keewatin District making special investigations in connection with the mineral explorations being carried on there by a number of private companies. During the winter of 1929-30 he prepared reports on his investigations.

Investigations by Mr. W. H. B. Hoare.—During the spring and summer of 1929, Mr. Hoare completed his investigations in the Thelon Game Sanctuary. He then travelled to Chesterfield, where he met the ss. *Beothic*, carrying the annual Arctic expedition of the Department of the Interior, and returned by it to Ottawa.

Investigations by Mr. J. Dewey Soper.—On April 14 Mr. Soper completed his program of surveys of Foxe peninsula and returned to his headquarters at Cape Dorset. On May 17 he set out from Cape Dorset in search of the breeding grounds of the blue goose, which, after many days' hard travelling, he was successful in discovering. The location of these grounds is near Bowman bay on Baffin island, and their final discovery solved a problem which has long baffled ornithologists. Returning to Cape Dorset, an additional voyage of 365 miles was made to connect with the ss. *Beothic*, on which Mr. Soper returned to Ottawa.

Investigations of Mr. A. E. Porsild.—During June and July, Mr. Porsild, special investigator for the Branch, made a botanical examination of Charlton island in James bay, part of Akimiski island, and parts of the Twin islands, with a view to ascertaining wild life conditions.

FIELD SURVEYS

Surveys by Mr. F. H. Kitto.—During the summer Mr. F. H. Kitto, D.L.S., was sent to Charlton island, James bay, to make a settlement survey at House point, where, for over 200 years, the deep sea-going vessels of the Hudson's Bay Company have discharged their cargoes. A tract of land extending along the shore for a distance of about a mile on either side of the landing place and having an average depth of about half a mile was surveyed out into eight lots, and a small piece of land used as a burying place was posted out as a cemetery.

Surveys by Topographical Surveys Branch.—By request, the Topographical Surveys Branch made a number of surveys along the Mackenzie river. At Fort Smith the hill road was surveyed to the waterfront and a number of subdivisions

were made in the settlement. Retracements and subdivisions were made at Good Hope and McPherson. A settlement survey of the entire Arctic Red River settlement was completed and a lot for a cemetery was laid out at Aklavik.

FIELD MEDICAL SERVICE

Pangnirtung.—Dr. L. D. Livingstone, Chief Medical Officer of the Branch, who was in residence at the Pangnirtung medical headquarters, returned to Ottawa in the fall of 1929 on the ss. *Beothic*. He was replaced by Dr. H. A. Stuart, who will have charge of medical affairs on Baffin island. Extensive patrols made by both Dr. Livingstone and Dr. Stuart brought them in contact with nearly all the natives of the Eastern Arctic. The general health of the Eskimos was found to be good and their living conditions satisfactory. Numbers of patients were given medical treatment and considerable surgical work was performed at headquarters.

Aklavik.—The medical station established by the Branch at Aklavik was in charge of Dr. J. A. Urquhart throughout the year. Owing to the lack of a suitable boat for summer travel, the medical officer was unable to cover as much territory as desired, but several winter patrols were made by dog-team. Arrangements have been perfected for the supplying of a suitable boat. Aklavik station serves particularly the needs of the Mackenzie Delta Eskimos and the few Indians that inhabit that region. The general health of the natives, both Eskimo and Indian, was somewhat better than during the previous year and no epidemics of any sort occurred in the district.

Establishment of Medical Station at Coppermine.—During the year a medical base was established at the mouth of the Coppermine river, and Dr. R. D. Martin was appointed to take charge of it. This base is designed to serve the natives of Coronation gulf, those westward as far as the territory served by the Aklavik depot, and eastward as far as circumstances permit. Materials for the necessary building, medical equipment, and supplies were shipped from Vancouver by the Hudson's Bay Company's ship, the *Baychimo*, and were safely delivered. Dr. Martin reached the Coppermine on August 23, and immediately took charge of the erection of a house and warehouse which were completed by the middle of October. Several patrols were made during the fall and winter by dog-team, and a number of natives were given attention.

Establishment of Medical Station at Chesterfield.—During the year arrangements were perfected for the establishment of a medical station at Chesterfield in Keewatin District. The construction of a doctor's residence was commenced under a contract. In March, Dr. L. D. Livingstone, Chief Medical Officer, who was selected to supervise the opening of this station, left Ottawa by train for Churchill from which point he proposed to travel by dog-team along the coast to Chesterfield.

Co-operation with the Department of Indian Affairs.—By a co-operative arrangement with the Department of Indian Affairs, three medical officers of that department act also as medical officers for the North West Territories and Yukon Branch. These officers were stationed at Fort Smith, Resolution, and Simpson.

Assistance to Mission Hospitals.—Financial assistance and medical supplies were given as usual to the hospitals that are maintained by the Anglican and Roman Catholic missions at Fort Smith, Hay River, Simpson and Aklavik. All hospitals were in charge of trained nurses.

VITAL STATISTICS

The Director is the Registrar General of Vital Statistics and is responsible for the recording of births, marriages, and deaths for the whole of the North-

west Territories. It is satisfactory to note that the last fiscal year compares very favourably with other years, as regards the general well-being of the native population.

FORT SMITH AGENCY

District Office.—The local office at Fort Smith was in charge of District Agent J. A. McDougal. His duties included those of Mining Recorder, Dominion Lands Agent, Crown Timber Agent, Superintendent of Wood Buffalo park and Chief Fire Warden. He also acted as Postmaster under the Post Office Department and had charge of wharves and aids to navigation for the Department of Marine and Fisheries.

Wood Buffalo Park.—The District Agent, in his capacity as Superintendent of Wood Buffalo park, has a staff consisting of a park warden and twelve game wardens.

ADMINISTRATION OF THE NORTHWEST GAME ACT

Because of the length of time involved in receiving returns at Ottawa from outlying trading posts, it is impossible to compile complete statistics of the fur trade for the past fiscal year for inclusion in this report. The fur returns for the fiscal year 1928-29 are given below, but, unless specifically stated otherwise, the general information refers to the fiscal year ending March 31, 1930.

The fur returns for 1928-29 showed a further slight decline in several species of fur bearers. There was, however, a marked increase in the number of muskrats taken. This, together with the increased value of the pelts of other animals, accounts for an increase in the value of the total yield by over \$100,000 as compared with the value of the fur yield of 1927-28. The following statement shows the number of pelts secured during the license year 1928-29:—

STATEMENT of pelts of fur-bearing animals traded under licences, or surrendered for bounty or under special regulation, during the licence year 1928-29, in the Northwest Territories.

	Mackenzie District	Keewatin District	Franklin District	Total
FUR-BEARERS				
Bear, black.....	133	3	11	147
“ grizzly.....	1	1	1	3
“ not specified.....	17	1	1	19
“ white.....	23	73	127	223
Beaver (traded).....	806	164		970
“ (surrendered under special regulation).....	2,391			2,391
Coyote.....	59			59
Ermine.....	15,611	24	13	15,648
Fisher.....	85			85
Fox, blue.....	64	11	34	109
“ cross.....	777	35	5	817
“ not specified.....	17			17
“ red.....	1,611	71	17	1,699
“ silver.....	85	4		89
“ white.....	9,125	4,617	1,803	12,545
Lynx.....	1,085			1,085
Marten.....	8,251	34		8,285
Mink.....	3,695	69		3,764
Muskrat.....	247,958	20	103	248,081
Otter.....	215	7		222
Skunk.....	17		26	43
Wolverine.....	159	21	3	183
Wolf (traded).....	96	82	7	185
“ (surrendered for bounty).....	800	76	164	1,040
BIG GAME				
Caribou.....	120	296	29	445
Moose.....	114	19		133

There was a close season on beaver in the Mackenzie District during 1928-29. The 970 beaver pelts listed above as traded, represent pelts held over by traders from the previous season and pelts secured in Keewatin District. The other 2,391 pelts were those of beaver taken by Indians and Eskimos under special regulation and surrendered to the Government.

Protected birds reported as taken under licences include 942 ducks, 43 wild geese, 343 grouse, 672 ptarmigan, and 87 prairie chickens.

Buffalo.—The warden service of Wood Buffalo park was maintained at full strength throughout the past year. It is estimated that there are now about 10,000 buffalo in this area. The herds wintered well and those animals recently transported from Buffalo national park at Wainwright, Alberta, and liberated with the native animals appear to be firmly established in their new habitat. A few aged buffalo, outcasts from the different herds, were slaughtered and the meat was distributed among needy native families, native boarding schools, and hospitals in the adjacent areas.

Musk-ox.—The original large herds of musk-oxen which formerly roamed over the northern part of Canada have been so reduced that now, according to the latest estimates, approximately only 13,000 remain, the majority of which are to be found on the islands north of the mainland. Reports of Branch field officers indicate that there are about 250 musk-oxen in the Thelon Game Sanctuary. These animals are fully protected.

Caribou.—Large herds were observed in the tundra area north and east of Great Slave lake by field officers of the Branch as they were returning by aeroplane from Bathurst inlet last fall. This was evidently the usual seasonal migration of the herds in this part of the North.

Beaver.—The Order in Council providing for a close season for beaver in the Mackenzie District was modified to enable needy Indians and Eskimos to take a limited number for food during 1928-29, conditional on the pelts being surrendered to the Government, in exchange for which credit at local trading posts was given. The returns indicate that 2,391 beaver were taken under this authority. The regulation providing a total close season on beaver in the Mackenzie District is now being enforced.

Muskrat.—The number of muskrat skins traded increased from 154,648 during 1927-28 to 248,081 during 1928-29. It would seem that the muskrat cycle has now reached its highest peak. These animals are reported to be very numerous in the Mackenzie delta. This large area is a splendid muskrat habitat and the field officers report that the large number of pelts taken from that area during the last hunting season has made no apparent decrease in the muskrat population, and that it is doubtful if the number taken was equivalent to the natural increase.

Wolf.—During the year 1928-29 warrants were issued covering the payment of bounties at the rate of \$30 per animal for the destruction of 1,040 wolves. This bounty is paid upon the surrender of the wolf pelt to the Crown by the person who kills the animal. In addition to the above, 185 wolf pelts were sold to traders, making a total of 1,225 wolves destroyed during the year 1928-29. This is a decrease as compared with the figures shown for the previous year and might indicate that the new system of payment of bounty has encouraged the hunters to greater activity and that the number of wolves in the Northwest Territories has already been materially reduced. The pelts surrendered to the Government for bounty were sold by auction in Montreal.

Coyote.—On March 11, 1929, Order in Council No. 418 was passed authorizing payment of \$15 bounty on each coyote killed in the Northwest

Territories and in that portion of the province of Alberta within the boundaries of the Wood Buffalo park, conditional on the pelt of the animal being surrendered to the Crown. This order became effective on July 1, 1929.

Revenue

The revenue collected under the *Northwest Game Act* for the fiscal year 1929-30 was as follows:—

Hunting licences..	\$18,952 95
Trading licences..	7,373 10
Bird licences..	55 00
Fur Farm licences..	37 00
Trading Post permits..	43 00
Sale of wolf pelts..	39,465 60
Fur Export tax..	758 70
Fines and forfeitures..	75 00
Total..	<u>\$66,760 35</u>

This is an increase of \$15,619.31 over the amount received during the previous year.

Licences.—Returns showing the issue of the following licences were received during the fiscal year 1929-30:—

	Number
Hunting: Resident..	309
Non-resident British..	192
Non-resident non-British..	50
Trading: Resident..	142
Non-resident British..	39
Non-resident non-British..	6
Game Bird licences..	11
Fur Farm licences..	8

Violations of Act.—There were six prosecutions for violation of the *Northwest Game Act* and three convictions during the year 1929-30.

PERMITS

Permits were issued or dealt with as indicated below:—

Purpose	Number
To establish trading posts..	30
To take and export mammals for propagation purposes..	3
To take mammals for propagation purposes during the open season (issued to holders of fur-farm licences)..	10
To trap and hunt fur-bearers, other than buffalo, in Wood Buffalo park.	312
To render <i>Migratory Bird Act</i> permits operative in the Northwest Territories (countersigned)..	15
To take specimens of mammals and non-migratory birds for scientific purposes..	8
To import liquor for medicinal purposes..	435
Explorers and Scientists permits—to permit the holder to enter the Northwest Territories for exploration or scientific purposes..	8

FUR EXPORT TAX ORDINANCE

The Fur Export Tax Ordinance was assented to by the Commissioner in Council of the Northwest Territories on May 7, 1929. It provides for the collecting of a tax on furs exported from the Northwest Territories and became effective on December 31, 1929. Up to March 31, the end of the fiscal year 1929-30, the amount of tax collected under the provisions of this ordinance was \$758.70. The furs on which this tax was levied were nearly all exported by aeroplane as the regular seasonal movement of furs since the tax became effective had scarcely commenced.

WOOD BUFFALO PARK

The warden service was maintained at full strength throughout the year. The several wardens who patrol the park estimate that the annual increase of the buffalo is from twenty to twenty-five per cent, and report that the animals are in excellent condition. Slight damage has been reported to the grazing grounds of the buffalo in certain places due to new dams erected by beavers, causing the overflow of several streams. This is conclusive evidence that the beaver in the park are increasing.

During the summer of 1929 a new telephone line was constructed from Hay Camp to Pine lake, a distance of 40½ miles. This brings the total mileage in the park up to 143 miles, connecting the superintendent's office at Fort Smith with the wardens' cabins and the cabins with each other. Two new cabins were constructed during the year. One is located on Jackfish river and the other on Nyarling river. A wagon road was completed from Hay Camp to Pine lake. Other roads were under construction throughout the park during the year. Several bridges had to be constructed because of higher water in various streams.

The warden service is equipped with eight portable pumps, each supplied with 2,000 feet of hose for fire-suppression purposes. This equipment is kept in first-class condition and is placed at strategic points throughout the park. At the end of the fiscal year the park service had forty-nine sled-dogs for use in winter patrol.

LANDS AND TIMBER

Disposal of Lands.—Practically the only lands disposed of in the Northwest Territories are lots in the various settlements that have been acquired by Roman Catholic and Anglican missions, fur traders and transportation companies in connection with their several undertakings, and lots for residence purposes and gardens. There are no regulations in force making provision for the acquiring of homesteads as in the Prairie Provinces, but lands suitable for agricultural purposes may be acquired by purchase after being surveyed.

The Northwest Territories Hay and Grazing Regulations make provision for the issuing of permits to cut hay on vacant Crown lands, and for the issuing of grazing leases for a period not exceeding twenty-five years. Temporary use of certain lands may be acquired under a licence of occupation. At the end of the year four grazing leases and five licences of occupation were in good standing. Two lots were reserved at Norman as a site for the erection of a radio station.

Administration of Timber.—Under the Timber Regulations free permits may be granted to educational, religious, and charitable institutions to cut fire-killed or dry timber for fuel purposes, the quantity not to exceed one hundred cords in a permit year. Fixed dues are charged on timber cut for other purposes and the total revenue derived from the disposal of Crown timber as saw-material, building logs, and cordwood during the year was \$3,584.85.

PURCHASE OF REINDEER HERD

In 1919 a Royal Commission was appointed to investigate the possibilities of the reindeer and musk-ox industry in the Arctic and sub-Arctic regions of Canada. In its report, issued in 1922, the commission recommended, among other things, that small experimental reindeer herds be established in a number of localities which might, after departmental investigation, be found suitable for such purpose. Acting on these recommendations, the Dominion Government, through the North West Territories and Yukon Branch of the Department of the

Interior, employed experienced northern botanists to investigate during 1926-27-28 the possibilities of certain areas in Mackenzie District where caribou formerly grazed in large numbers but were no longer to be found.

This investigation indicated that the proposal to establish reindeer herds in the Northwest Territories appeared well advised. The Dominion Government immediately took the necessary steps to acquire an initial herd of animals. By Order in Council of May 1, 1929, the Minister of the Interior was authorized to purchase 3,000 head of reindeer in Alaska, where semi-domesticated reindeer have been bred for many years. Under the terms of a contract which was made subsequently, the vendors agreed to select this number from the largest and most virile animals in their possession, and to deliver them at a location east of the Mackenzie delta. In the fall of 1929, one of the Branch's special investigators, who had made the preliminary field investigations in this connection, was sent to Nome, Alaska, to represent the Department in the selection of the reindeer being purchased. He spent two months on this work and witnessed the start of the "drive" of the animals on their way to Canada. Arrangements for the reception and care of the reindeer on their arrival at the Mackenzie delta were begun before the end of the fiscal year and will proceed during the summer of 1930. The necessary buildings and corrals will be erected and other arrangements made.

TRANSPORTATION

Roads.—As yet the only road in the Northwest Territories on which the Branch has expended monies other than in Wood Buffalo park, is that leading from the settlement of Fort Smith to the steamboat landing at the foot of the river bank. This road, which was very steep and difficult of travel, was improved during the year.

Aids to Navigation.—The district agent at Fort Smith, acting for the Department of Marine and Fisheries, set out buoys as usual in the spring at the mouth of Slave river and on Great Slake lake, and took them up at the close of navigation.

Landing Fields.—Preliminary steps were taken to assist in the preparation of temporary landing places for winter aircraft and for dockage for hydroplanes landing near the principal settlements. The matter of providing permanent landing fields received consideration.

MAIL AND RADIO

Improved Mail Service.—The Post Office Department of Canada maintained the following post offices in Mackenzie District—Fort Smith, Resolution, Hay River, Providence, Simpson, Wrigley, Norman, Good Hope, Arctic Red River, McPherson, and Aklavik. A post office was also maintained at Herschel, Herschel island, Yukon Territory. During the season of open navigation these offices, as far north as Simpson, were provided with a weekly mail service. North of Simpson the summer schedule of 1929 called for seven mails to Wrigley and Norman, six to Good Hope, five to Arctic Red River, McPherson, and Aklavik, and three to Herschel. Arrangements were made by the Post Office Department for the carrying of occasional mails by the Hudson's Bay Company to Rae and Liard. Way sacks for the exchange of mails between intermediate points were provided.

In November, 1929, the Post Office Department inaugurated a winter air mail service to Mackenzie River offices. A flying base was established at McMurray for this work. The announced schedule called for a weekly service between November 26, 1929, and April 8, 1930, to Chipewyan, Fitzgerald, Fort

Smith, and Resolution. Hay River, Providence, and Simpson were to receive six mails and Wrigley, Norman, Good Hope, Arctic Red River, McPherson, Aklavik, and Herschel three mails during this period. Outgoing mail was to be carried on all return trips of the planes.

Radio Stations operated.—The following stations in the Mackenzie-Yukon radio system were operated throughout the year: Edmonton, in Alberta; Fort Smith, Resolution, Simpson, and Aklavik, in Mackenzie District; and Dawson and Mayo, in Yukon. That at Herschel was operated during the summer months.

Inauguration of Weekly Bulletin.—For several years the residents of Mackenzie district have had the great benefit of a system of wireless communication, but it was felt that something more could be done with this equipment. With the co-operation of the Department of National Defence, arrangements were perfected during the past year whereby every day one of the officers of the Department of the Interior at Edmonton prepares a 500-word bulletin of news of special interest to northern residents and this is broadcast to the receiving stations in the North. The bulletins thus received are posted at the local offices of the North West Territories and Yukon Branch where they may be read by everybody. Although in use only a short time, many messages of appreciation of this service have been received from the north country.

EDUCATION

Aid to Mission Schools.—The Department of the Interior has no public school system in Mackenzie District but grants for educational purposes are made to the Anglican and Roman Catholic Churches, both of which maintain day and boarding schools for white and native children in connection with their missions.

Schools Operated by Missions.—The Anglican Church operated during the year, a boarding school for Indian and Eskimo children at Hay River, a day school at Simpson, a day school at McPherson, a day school at Aklavik, and a day school at the mouth of Coppermine river. A boarding school for Eskimo children was established recently at Shingle Point, Yukon Territory, on the Arctic coast.

The Roman Catholic Church operated a day school at Fort Smith, a boarding school for Indian and half-breed children at Resolution, a similar boarding school at Providence, a day school at Simpson, a summer day school at Wrigley, a day school at Good Hope, and a boarding school for Indian and Eskimo children at Aklavik. In addition to these schools, provision was made for the holding of classes for children temporarily gathered in the vicinity of any point where there is a mission.

LAW AND ORDER

Royal Canadian Mounted Police Establishment.—Law and order were efficiently maintained throughout the year by the Royal Canadian Mounted Police. The establishment of this force in the Northwest Territories consists of between eighty-five and ninety officers and men distributed among more than twenty widely separated posts. With a highly organized staff of picked men placed in these strategically located posts, this force was able to cope adequately with the situation. A minimum of crime was reported throughout the year.

Patrols by the Police.—An outstanding feature of the work performed by this force is the patrol system. At convenient times during the year—both

summer and winter—members of the various detachments journey back and forth on long patrols to keep in touch with each other, to exchange mail, and to visit natives, trappers, and traders along the way or in outlying sections of the country assigned to each detachment. In this way a close touch is kept on general conditions and the natives are made to feel that the Government has an interest in their welfare. The reports of many of these long patrols, especially those made by dog-team during the depth of winter, involving hundreds of miles of travel across unexplored areas, make most absorbing reading and are of great value in adding to the general knowledge of the country.

The most outstanding patrol of the past year was that made in the Arctic archipelago by Inspector A. H. Joy. On March 12, 1929, Inspector Joy left detachment headquarters at Dundas Harbour on the south coast of Devon island with Constable Taggart and one Eskimo and two dog-teams as his main support, and Constable Hamilton and another Eskimo with a third dog-team as reinforcements for a few days. On May 31 he arrived at Bache Peninsula detachment headquarters on the east coast of Ellesmere island, after having made a successful patrol of over 1,700 miles in 81 days that took his little party by a circuitous route over a vast area of the northerly part of the Canadian Arctic archipelago. On this patrol Inspector Joy made many side excursions to examine interior parts of the islands visited, in some instances erecting cairns to mark his visits.

Court Proceedings.—During the summer of 1929, Hon. Lucien Dubuc of Edmonton, Stipendiary Magistrate for the Northwest Territories, journeyed down the Mackenzie river with a full court and at the principal posts disposed of the docket of cases awaiting trial.

Appointments.—The following official appointments were made during the year: four coroners (including Dr. R. D. Martin at Coppermine and Dr. H. A. Stuart at Pangnirtung), ten notaries public (reappointed), four justices of the peace, and twenty-five commissioners for taking affidavits.

YUKON

YUKON COUNCIL

Personnel of Council.—The members of Council who were elected on August 29, 1928, for a three-year term are: W. L. Phelps, Whitehorse District; Frank Carscallen, Mayo District; and A. T. Taddie, Dawson District.

Session of Council.—The Yukon Council was in session from June 4 to June 12, 1929. There were some amendments made to existing ordinances, and ordinances were passed providing for the payment of a bounty on wolves and coyotes, and also to regulate the hours of labour in placer mining operations.

Under the ordinance to provide for the payment of bounty on wolves and coyotes the sum of \$2,125.05 was expended. This small amount was due to the fact that it was not possible to have information as to the payment of a bounty transmitted to outlying districts in time for the payment of such bounty during the year; and further many pelts have been shipped outside by the trappers themselves. It is anticipated, however, that a considerable increase will be noted in the coming year.

LANDS AND TIMBER

Land Administration.—The revenue collected from Dominion lands in the form of rentals, and office, homestead entry, and hay permit fees, amounted to \$3,297.58. There were no sales of land. Land rentals accounted for \$3,268.58; office fees for \$16.50; homestead entry, \$10; and hay permits, \$2.50.

Timber Administration.—The kinds and quantities of the various classes of timber cut were as follows: saw-timber, on which dues were paid, cut under permit 105,908 feet board measure; fuel-wood cut under authority of permit 14,560 cords; fuel-wood cut without authority of permit and on which seizure dues were paid, 54 cords; logs cut without authority of permit, 384 linear feet; fuel-wood cut on timber berths on which dues were paid, 1,377 $\frac{3}{4}$ cords.

The total revenue derived from Crown timber amounted to \$7,807.38; made up of royalty, \$688.90; permits, \$7,056.80; and seizure dues, \$61.68.

AGRICULTURE

The season was favourable for crops with abundant moisture, which resulted in well matured crops of an excellent quality.

BIG GAME

Big game was reported as being very plentiful. There were several parties of big game hunters in the Territory last year, and they were very enthusiastic with the results of their hunt.

PUBLIC WELFARE

Hospitals and Public Health.—The hospitals at Whitehorse, Dawson, and Mayo were maintained in their usual state of efficiency and the health of the residents of the Territory has been excellent.

Education.—The number of pupils in the different schools remained at about the same level as last year. Public and high schools were maintained at Dawson, Whitehorse, Mayo, and Keno, and assisted schools at Carcross and Tagish.

Law and Order.—Law and order were well maintained throughout the Territory by the Royal Canadian Mounted Police, and frequent patrols have been made to the outlying districts.

TRANSPORTATION AND COMMUNICATION

Railway and Steamboat Service.—The White Pass and Yukon Railway was operated throughout the year between tidewater at Skagway, Alaska, and the head of navigation on the Yukon river at Whitehorse, Yukon. Steamboats were operated between Whitehorse and Dawson, Dawson and Mayo, and Dawson and lower river points during the open season.

Tourist Traffic.—The number of tourists visiting Dawson during the season of navigation on the Yukon river and especially during the months of July and August was greater than during any previous year. The popularity of the Yukon trip is steadily increasing. Many tourists went as far north as Carcross and then turned aside to visit Atlin in northern British Columbia. Big game hunters were as active as ever in the Kluane, MacMillan and other favourite regions.

Aviation and Landing Fields.—The use of aircraft as a means of rapid transport and for carrying mails has increased greatly. Landing fields for aeroplanes have been prepared at Whitehorse, Dawson, Mayo, and Keno, also an emergency field at Minto, which was constructed by the Treadwell Yukon Company.

In winter, planes land on the frozen surface of the rivers in front of Dawson, Mayo, and Whitehorse, as this plan is more convenient to the settlements and the ice makes a better field for winter use than the land. It is also possible to land at Dawson, Mayo, and Carcross in the summer with pontoons, as there is

sufficient depth of practically still water to make successful landings. The landing field at Dawson is situated at the mouth of Bonanza creek on mining ground leased by the Yukon Consolidated Gold Corporation, Limited.

Roads, Bridges, and Public Works.—The roads in the Territory were maintained in as fair a condition as possible consistent with the amount of money available for such work.

Last year a steel bridge for erection across the Mayo river at Minto bridge, to replace the old wooden structure, was ordered from Vancouver and transported to the mouth of the Stewart river. It is the intention to have the bridge material transferred to Mayo at the opening of navigation and, if possible, arrangements will be made for its construction during the coming season. On account of the very heavy tonnage of ore which passes over the present wooden bridge, it is considered advisable to replace it with the new structure as soon as funds are available.

Mails, Telegraphs, and Radio.—The usual mail service was continued throughout the year. The old Hazelton-Dawson land telegraph line was in operation, and radio stations were operated at Dawson and Mayo throughout the year, and at Herschel during the summer season.

Public Health.—During the summer the health of the Territory has been excellent. The number of deaths was small, and the mortality rate was low. The health of the Territory has been excellent.

Education.—The number of pupils in the different schools remained about the same level as last year. The schools were maintained at Dawson, Whitehorse, Mayo, and other places. The schools were maintained throughout the year and other well maintained throughout the Territory by the Royal Canadian Mounted Police, and frequent patrols have been made to the outlying districts.

TRANSPORTATION AND COMMUNICATION

Railway and Steamboat Service.—The White Pass and Yukon Railway was operated throughout the year between Dawson and Whitehorse, and the head of navigation on the Yukon river at Whitehorse, Dawson, and Mayo. The service was excellent during the open season.

Yukon River.—The number of boats visiting Dawson during the season of navigation on the Yukon river and especially during the months of July and August was greater than during any previous year. The popularity of the Yukon river as a tourist route was at its height at Dawson and Mayo. The number of boats visiting Dawson during the season of navigation on the Yukon river and especially during the months of July and August was greater than during any previous year. The popularity of the Yukon river as a tourist route was at its height at Dawson and Mayo. The number of boats visiting Dawson during the season of navigation on the Yukon river and especially during the months of July and August was greater than during any previous year. The popularity of the Yukon river as a tourist route was at its height at Dawson and Mayo.

Emergency Field at Minto.—The use of an emergency field at Minto, which was constructed by the Treadwell Yukon Company, was found to be of great value. The use of an emergency field at Minto, which was constructed by the Treadwell Yukon Company, was found to be of great value.

VII

SURVEYS BUREAU

REPORT OF THE DIRECTOR GENERAL OF SURVEYS, J. D. CRAIG

The Surveys Bureau comprises the following branches or divisions engaged in surveys or related work, namely:—

Geodetic Survey of Canada.

Topographical Survey.

International Boundary Commission (Canadian Section).

Aerial Surveys.

Town Planning.

The Director General of Surveys is the head of the Surveys Bureau and is also International Boundary Commissioner representing Canada. In addition, he acts as Chairman of the Geographic Board whose function it is to decide upon place-names in the Dominion submitted for approval by any of the federal departments or by the provincial authorities.

The Geodetic Survey continued the general scheme of triangulation and levelling which will ultimately cover the whole country, and lead to the establishment in every locality of one or more selected stations whose geographic position (latitude and longitude) and elevation above sea-level are known to the highest degree of accuracy. Such points when permanently marked provide control for mapping and engineering operations of federal and provincial departments, municipalities, corporations, and private persons. The employment of aeroplanes for reconnaissance and the transportation of parties in the newer portions of the country has proven most advantageous, and has resulted in the speeding up of the work. Nine volumes were issued containing the results of the levelling operations of the Survey throughout the country, and in addition some geodetic research work was done and valuable data were recorded in connection with the investigation of isostasy.

The field work of the Topographical Survey included control surveys, aerial surveys, ground surveys for topographical mapping, legal surveys, land classification work, interprovincial boundary surveys, and surveys for determining magnetic declination. Eighteen parties were employed and in addition three engineers acted as navigation officers with the Royal Canadian Air Force planes engaged in taking aerial photographs. New map sheets were issued covering 106,302 square miles, of which 71,898 square miles were covered by map sheets of the National Topographic Series. The Physical Testing Laboratory continued the testing, adjustment, and certification of various scientific instruments, more than half its operations being conducted on behalf of other departments and organizations. It is interesting to note that a one-metre nickel rule formerly in possession of the laboratory has now been adopted by Order in Council as the legal metre for Canada.

The International Boundary Commission, Canadian Section, under a co-operative arrangement with the United States Section, undertook to reopen the vista and repair the monuments on a section of the Quebec-Maine boundary. The boundary was also marked in a suitable way on a number of international highways, bridges, and tunnels. Fourteen boundary map sheets were issued and signed by the Commissioners.

The Aerial Surveys Division, organized about a year ago, assists in carrying out the program as approved by the Departmental Aerial Committee and thus forms the point of contact with the Air Force. Another important function of this division is the initiation of experimental work looking to the extension of aerial surveying into new fields of usefulness.

The Town Planning Division functions as the central educational agency for the promotion of town-planning practice throughout the Dominion. During the year a large number of articles have been contributed to the *Town Planning Journal*, many of which have been copied for editorial use by the newspapers of the country. A large correspondence is maintained with those centres where town planning is in progress or in the initial stages, and suitable literature is supplied for guidance as to procedure. The annual convention of the town-planning fraternity is largely dependent upon the division for organization, and an officer of the division attended the Winnipeg convention last year and took a prominent part in the transactions.

A brief summary of the work of the chief divisions of the Bureau, as listed above, follows. Detailed reports covering the activities of the Geodetic Survey and the Topographical Survey are issued as separate publications, and there is also available a separate report of the work of the Surveys Bureau as a whole.

GEODETIC SURVEY

The Geodetic Survey of Canada determined with the highest attainable accuracy the geographical positions of an increased number of geodetic stations in Canada required as basic control for Canadian mapping operations, and established the precise elevations of bench-marks above mean sea-level at points distributed over an increased mileage along Canadian railway tracks and highways, thus providing control datums for the mapping and engineering operations of federal and provincial departments, municipalities, corporations, and private persons.

Triangulation nets and precise traverses of first-order and second-order of accuracy were extended and base lines for length control in triangulation were measured with first-order accuracy. Laplace stations combining observations for latitude, longitude, and azimuth were established. The precise traverse and base line tapes were standardized. Geodetic research was carried on, and data of value in the investigation of isostasy were obtained. Geodetic results were printed and distributed, and material was prepared for presentation at the Fourth General Conference of the International Geodetic and Geophysical Union meeting at Stockholm, in 1930.

Triangulation and Precise Traverse.—The western and northern portions of the triangulation and precise traverse control loop in British Columbia, which comprises 1,150 miles of first-order triangulation and 200 miles of first-order traverse through the interior of British Columbia, were completed. The uncompleted portion of this control loop follows the Fraser River valley.

In Saskatchewan first-order triangulation in the area from Lloydminster to Prince Albert, and reconnaissance south from Prince Albert to the international boundary were completed. Stations were selected for an extension from the main net at Prince Albert for control in the Prince Albert National Park area.

In Ontario first-order triangulation was completed from North Bay to Sudbury, and a first-order traverse was extended northerly from Cochrane.

In Quebec the aeroplane reconnaissance carried out in 1928-29 between Senneterre and La Tuque was checked by ground methods. Reconnaissance was completed by aeroplane for a net from Oskelaneo one hundred miles towards lake Chibougamau. The first-order triangulation northward from

Ottawa was extended along the Gatineau valley. The advantages to be gained by the use of the aeroplane for reconnaissance observations, and for the transportation of parties and their equipment, have been demonstrated.

In the Maritime Provinces a triangulation through the western portion of New Brunswick was completed. The elevations of a number of the most prominent hills in New Brunswick were determined by trigonometric levelling.

Levelling.—Field parties of the Levelling Division operated in five of the provinces—a precise levelling party in British Columbia, a secondary levelling party in Quebec, one party of each kind in the province of Ontario and, in addition to these four regular parties, a special party engaged in the establishment of fundamental bench-marks in certain cities and towns in the provinces of Manitoba and Saskatchewan.

The British Columbia party established precise level bench-marks along the Cariboo road between Quesnel and Prince George, and, later on, ran north-erly from Victoria along the Esquimalt and Nanaimo railway. The Quebec party was occupied in the Saguenay and Lake St. John areas. One of the Ontario parties worked in the Rouyn district—between Swastika, Ontario, and Taschereau, Quebec—and then carried levels some sixty-five miles north of Cochrane along the recently constructed extension of the Timiskaming and Northern Ontario railway. While a small portion of this party's work lay within the province of Quebec, the other party spent the whole season in Ontario, completing the levelling along the Pembroke-North Bay highway westerly from Deux Rivieres—the point at which the previous season's levelling had been discontinued—and then proceeding to the Parry Sound district, where the remainder of the season was spent. A line of levels was completed from North Bay to Parry Sound and continued southeasterly, for some distance, towards Bracebridge.

During the past twelve months there have been released to the public nine publications comprising a complete revision of the precise levelling in the Dominion as carried on by the Geodetic Survey since its inception. These publications cover precise levelling in the Maritime Provinces, Quebec South, Quebec North, Ontario South, Ontario North, Manitoba, Saskatchewan, Alberta, and British Columbia. This is the first time that the precise levelling information based on one datum extending from the Atlantic to the Pacific seaboard has been published. In order to accomplish this, it has been necessary, for several seasons past, to do considerable revision of level lines in the field and to carry out a complete inspection of bench-marks. The publications have been issued in dictionary form in which the bench-marks are listed under the names of the nearest railway stations arranged alphabetically.

Triangulation Adjustment.—Geodetic survey data as requested by federal and provincial bureaus, and by the engineering public have been furnished. A report on triangulation in the Bay of Fundy area with an extension from Truro to Halifax, thence to Liverpool, Nova Scotia, has been printed and distributed.

Precise Levelling Adjustment.—A publication *Adjustment of the Precise Level Net of Canada, 1928* was issued. This publication described the net in general, the orthometric and other corrections necessary to field work, and the methods of adjustment employed; it also gave the resulting elevations. This adjustment was based on tidal stations on the Atlantic and Pacific coasts and a temporarily-adopted elevation for Rouses Point on the boundary between the United States and Canada. A new adjustment was made later, omitting the Rouses Point datum, and elevations were obtained for all points in the Canadian net based on Canadian tidal values only.

Laplace Observations.—Observations for the determination of latitude and longitude were made at a number of stations in the triangulation of the Northern Ontario-Quebec area, the Gaspé Peninsula and Chaleur Bay areas, along the west shore of Hudson bay and on the Ontario-Manitoba-boundary. A publication entitled *Deflection of the Plumb Line in Canada* was prepared for the printer.

Base Lines.—First-order base lines were measured near Kitscoty, Alberta, and at Kinistino, Saskatchewan, to provide length control in the Alberta-Saskatchewan triangulation.

Standards.—The fifty-metre invar tapes, used both in base-line measurement and in precise traverse, were standardized before and after their field use in 1929.

Isostasy.—As a result of observations in Gaspé peninsula, valuable data were recorded in connection with the investigation of isostasy. The Survey has been able to devote only a limited amount of time to this work.

Geodetic Research.—On account of the vast area of Canada, many problems in geodesy have arisen. Among these is the problem of determining the geodetic position of a point from a point the position of which is already known when the line between the two points is very long (say over one hundred miles). This problem has been satisfactorily solved and will have many applications in practical geodesy.

The treatise, *The Simultaneous Adjustment of Precise Traverse and Triangulation*, has recently appeared in printed form and is now ready for distribution. This treatise was prepared primarily to take care of the joined systems of triangulation and precise traverse control in the provinces of Ontario and British Columbia.

TOPOGRAPHICAL SURVEY

Canada is still undergoing a process of development. Great national problems have to be faced such as the extension of our railway systems to the north, the utilization of our water-powers and the development of our great transportation waterways. The provinces, the counties, the municipalities, the cities, all in their respective spheres, have similar problems to be worked out consequent upon their growth and development. In the intimate study of such problems, which constantly confront our administrators, more and better information is needed than can be shown upon geographical or general maps. This need is met by what are known as topographical maps. Such maps have many uses and serve as a base on which most problems affecting human activities may be studied and investigated, and plans made for their solution.

The production of these topographical maps in an orderly and systematic way for a new country of the size of Canada, is an immense undertaking. With much of the immediate development taking place in forest-covered regions lying back from present settlement, regions where ground access is particularly onerous, special difficulties are to be encountered and must be surmounted.

It is here that the new science of mapping by the use of aerial photographs has proved its value and is fitting so well into Canada's necessities. It is a science of which Canadians may well be proud. For in Canada this science has received its greatest impetus and its greatest application toward the solution of national problems. Methods devised by the Topographical Survey and improved by them have been made use of in other parts of the world, where similar mapping problems have presented themselves. In the aerial mapping operations the aerial photographs are taken through the co-operation of the Royal Canadian Air Force of the Department of National Defence.

In the making of maps, of course, certain ground surveys are required in order to co-ordinate the air and surface operations. In this connection, the methods of mapping as carried on at present in the Topographical Survey have been largely reorganized of late years to take into account the requirements of the new science. In all the field operations it may be stated that the ultimate aim of producing a national topographic map of the entire Dominion is kept well in mind. Although certain classes of surveys may be carried on primarily for purposes which may seem far removed from such a program, they all contribute to this national undertaking.

Field operations were carried on during the year in all the provinces, in the Yukon Territory and in the Northwest Territories. In the prosecution of these field operations eighteen separate parties were employed and, in addition, three surveys engineers acted throughout the season as navigation officers with the planes of the Royal Canadian Air Force engaged in taking photographs for aerial mapping operations. Co-operation was also maintained with the provincial authorities in carrying on the work and in gathering topographic data for presentation upon the map sheets.

The area covered during the year by newly-issued topographical map sheets was 106,302 square miles. Of this amount, 71,898 square miles were covered by map sheets of the National Topographic series—standard, provisional, and exploratory editions—and the remainder by sheets of the Sectional Map series and in a few cases by other map sheets designed to meet special needs.

FIELD WORK

The field work of the Topographical Survey as performed during the fiscal year may be classified under the headings of control surveys, aerial surveys, ground topographical mapping (including photo-topographical mapping), legal surveys, land classification work, interprovincial boundary surveys, and precise declination surveys.

Control surveys are those which are made for the purpose of rectifying or correlating all other survey work of a less precise nature. In Canada, all primary control, both horizontal and vertical, is the particular function of the Geodetic Survey of Canada, to which all secondary control surveys are adjusted. One of the principal functions of the Topographical Survey is to provide mapping control for the topographical maps of Canada. Such mapping control surveys include triangulation, chained traverses, stadia traverses, and the determination of latitude and longitude values by astronomical observation. All of these are tied in and adjusted to points of the Geodetic Survey, wherever such exist, and form the basis on which all detailed topographical surveys are plotted. To-day most of the detailed topography is plotted from aerial photographs on which points established by control surveys have been identified. Control for new topographical mapping during the year comprised 884 miles of precise chained traverse, 935 miles of stadia traverse, the establishment of geographic positions by astronomical observations at eleven different points, and some triangulation.

Aerial surveys comprise the taking of aerial photographs, whether oblique or vertical, in co-operation with the Royal Canadian Air Force. During the year 48,025 square miles were covered by oblique and 26,230 square miles by vertical photographs. Ground topographical mapping includes the obtaining of topographic detail by the use of the plane-table, by the interpretation of aerial photographs, and also by photo-topographic and other methods. A total of 9,502 square miles was so covered. Legal surveys are carried on for defining boundaries for the administration of lands. Although such surveys extended into six of the provinces, and into the Yukon and Northwest Territories, the greater portion of the work during the past year was in the three Prairie Prov-

inces. Land classification surveys deal with the obtaining of particularized topographical information specifically relating to possibilities for settlement. In the work for the past season this was rather of a reconnaissance nature and had for its immediate object the determination of the advisability or otherwise of subdividing certain lands. Over 800 square miles were so investigated. The interprovincial boundary surveys refer in this report to the delimitation of a portion of the Manitoba-Ontario boundary; and the precise declination surveys include the taking of observations for the declination, or "variation", of the magnetic compass needle, and in a few cases for its declination and horizontal force component.

The following is a brief summary of some of the more outstanding items of the field work, given by provinces, excepting for the precise declination surveys which are treated separately.

Nova Scotia.—For control in later topographic mapping 148 miles of chain traverse (including some retracements of previous work) and 96 miles of spirit levelling were run, and 27 monuments were established on the ground. The interpretation of aerial photographs over portions of the southern tip of the peninsula comprising 2,140 square miles was completed, and 970 square miles were covered by vertical aerial photographs.

New Brunswick.—For control 290 miles of chain traverse and 310 miles of spirit levelling were run, and 72 monuments were established on the ground. The plane-table survey was completed for the Moncton two-mile sheet of the National Topographic Series which extends also into Prince Edward Island, and a field interpretation of aerial photographs made for another two-mile sheet lying to the west, a total of 1,880 square miles being so covered. Vertical aerial photographs were taken over an area of 1,125 square miles.

Prince Edward Island.—A special plane-table survey was undertaken in the vicinity of Malpeque bay for the production of map sheets, relating to the administration by the Department of Fisheries, of oyster beds in that vicinity. In connection with this work there was a total of 10 miles of chained traverse and 15 miles of spirit levels run, 65 monuments established, a small base measured, and 142 transit stations occupied for triangulation purposes. Other plane-table work related to the completion of the Moncton two-mile sheet referred to above. New mapping comprised 112 square miles.

Quebec.—For control 368 miles of chained traverse, 277 miles of spirit levels, and 32 miles of stadia levels were run, and 78 monuments were established. Latitude and longitude observations were made at 10 different stations. About 625 square miles of new mapping was done with plane-table supplemented by vertical aerial photographs. Some 8,860 square miles of new territory were covered by vertical aerial photographs. One historic site was surveyed.

Ontario.—For control 76 miles of chained traverse and 270 miles of spirit levels were run, 19 monuments were established, and observations for latitude and longitude were taken at one station. New mapping entailing the field interpretation of aerial photographs over 2,905 square miles in the Parry Sound-North Bay region was undertaken. Vertical aerial photographs over 4,780 square miles and oblique aerial photographs over 19,825 square miles of new territory were taken. In connection with the mapping work in Ontario the active participation begun three years ago by the province, in the national mapping program, has been continued with very satisfactory results. The control provided by field parties of the provincial Department of Surveys is an outstanding factor in the preparation of the map sheets issued in the province. Preliminary work was completed for the delimitation of that portion of the Ontario-Manitoba boundary extending from its point of intersection with the 12th base

line of the Dominion Lands system of survey to the east end of Island lake. This consisted of the running of a trial line over the portion covered, the final delimitation to be effected later. One historic site was laid out.

Manitoba.—Special work in the province of Manitoba consisted of the topographical mapping of 700 square miles in the Roseau River basin, adjoining the international boundary. This survey was required for the intensive study of certain problems of an international nature relating to the district. In carrying out this work 960 miles of spirit levels were run, 80 square miles of plane-table work undertaken, and 47 rock posts established in connection with vertical control. Vertical aerial photographs over 4,265 square miles and oblique aerial photographs over 14,700 square miles were taken. Miscellaneous legal surveys were performed in eleven different townships and, in addition, Indian reserves were surveyed at two different localities. The work in connection with the delimitation of the Ontario-Manitoba boundary is mentioned above under Ontario.

Saskatchewan.—For control purposes 585 miles of stadia traverses were run, astronomical observations for latitude and longitude were taken at three stations, and 61 monuments were established on the ground. Vertical aerial photographs over 355 square miles and oblique aerial photographs over 13,500 square miles were taken. Miscellaneous legal surveys were performed in 17 different townships and in one Indian Reserve. Some 64,000 acres of land lying east of Cold lake were covered by land classification surveys.

Alberta.—Subdivision of lands for settlement was carried on in a number of townships in the Peace River district. The territory subdivided was largely determined as a result of land classification surveys, some 453,760 acres being so classified during the year of which 151,200 acres were subsequently subdivided. Other miscellaneous legal surveys were carried on in 14 other localities by officers of the Topographical Survey.

British Columbia.—For control purposes 350 miles of stadia traverse were run, along which also stadia levels were taken. Co-operation was maintained with the provincial Government in the survey of the Pacific Great Eastern Railway Block north of Prince George. Vertical aerial photographs were taken over about 5,000 square miles of this area, which with other areas so covered make up a total of 5,875 square miles. Some 1,140 square miles were covered by ground-mapping—largely photo-topographic—methods. A survey of certain Indian reserves was made in the Railway Belt.

Yukon Territory.—A survey of 40 miles of road from Mayo to Dawson was made under contract, the engineer in charge not being a member of the staff.

Northwest Territories.—Miscellaneous legal surveys were carried on by an officer of the Survey at various settlements along the Mackenzie River system from Fort Smith to Aklavik. Under instructions from the Survey, a Dominion Land surveyor on the staff of the North West Territories and Yukon Branch made a survey of some group lots on Charlton island in James bay.

Precise Declination Surveys.—During the year the Topographical Survey made some 1,600 precise measurements of the true direction of the compass needle in Canada in conjunction with its other work, bringing the total number to 26,000. These observations were begun in 1880 and are taken at very little expense as such measurements require but a few minutes of time when the surveyors are already on the ground with their surveying instruments and have data available regarding azimuth. Since the needle of the magnetic compass does not point true north but more or less to the east or west at different

places, this work is of great practical value in a large, new country such as Canada for surveyors, airmen, navigators, explorers, miners, prospectors, timber cruisers, settlers, foresters, and hunters. The work was carried on in close co-operation with the Meteorological Service of Canada, the Dominion Observatory, the Ontario Department of Surveys, the North West Territories and Yukon Branch of the Department of the Interior, and various provincial governments and surveyors. During the 1929 season, the Ontario Department of Surveys made about 200 such measurements and the North West Territories and Yukon Branch about 400. The information is published in the form of declination charts on the map sheets of the National Topographic series and the Sectional Map series, in order that it may be shown in the most readily accessible and convenient form for compass users. Every five years it is published in the form of a magnetic declination chart of Canada.

PRODUCTION OF MAPS

All survey returns after being compiled into a form suitable for the preparation of maps, are drafted, photographed, and printed in colours on lithographic presses in quantities sufficient for distribution. Advance copies or copies on a definite scale for plotting are made in the form of photographic prints. Other work in this connection entailing the use of the photographic equipment, is done as required. Maps of important urban areas or of areas of special interest are built up in relief.

Editions of 71 maps and 50 editions of township and townsite plans were printed and 31 relief maps were made. Included in this list were 12 map sheets of the National Topographic series.

PHYSICAL TESTING LABORATORY

At the request of the Commissioner of Customs the laboratory undertook the determination of some refractive indices of samples of ethyl and methyl alcohols. The work extended over a considerable period and involved a large number of observations. It is proposed to utilize the results in the analytical work of the Customs and Excise Laboratory. Further investigations are planned to include observations with isopropyl alcohol, now being employed in cheap perfumes, etc.

The one-metre nickel rule of the Laboratory, No. 306, has been formally adopted by Order in Council as the Dominion Standard for the International Metre, in accordance with the provisions of the *Weights and Measures Act*. This rule is a high grade precision standard, and having been compared three times directly with the International Standard measures at Sevres (the last occasion being during the year under review), it is suited in every way to be the legal reference standard of the Dominion.

During the year the laboratory certified 503 hydrometers, the majority of these being for the Department of National Revenue.

A bulletin has been prepared describing the characteristics, adjustment, use, and testing of aneroid barometers and altimeters.

As in former years assistance has been rendered to many different organizations, considerably more than one-half the work of the Laboratory being conducted on behalf of other Government departments or on behalf of external organizations, on a repayment basis.

REGISTRATION, RECORDS, AND DISTRIBUTION

Survey returns received for examination—from surveyors in the field, railway companies, and provincial governments—and entered in the different registers and plotted in the various index maps, comprise 513 books of field notes,

525 plans, and 1,403 miscellaneous returns. During the year, 339 new books and 613 new plans were placed on record, the total number on official record now being 20,813 books and 37,075 plans.

There were distributed 68,819 copies of the various maps of the Topographical Survey, 6,026 publications, and 13,360 official plans of townships, townsites, etc.

INTERNATIONAL BOUNDARY COMMISSION—CANADIAN SECTION

It was with great regret that the commission learned of the untimely death on April 9, 1929, of the United States Commissioner, the late Colonel E. Lester Jones. While Colonel Jones had not been in good health for some time previous, his sudden end was quite unexpected and was a distinct shock. Mr. Jas. H. Van Wagenen, formerly engineer to the United States section of the commission, was appointed commissioner by President Hoover on May 3, to succeed the late Colonel Jones.

A conference between the Canadian commissioner and the engineer to the United States section of the commission was held in Washington in April, 1929, when a division of the field work to be done during the following summer was agreed upon. A second conference was held in Ottawa in November, 1929, when details concerning the completion of the joint reports required by the treaty of 1908 were discussed.

As a result of the first conference, above referred to, the United States section undertook the following work: to erect monuments of a special type to mark the points where the boundary is crossed by recently constructed highways, at Emerson, Manitoba; and Wild Horse, Alberta; with the co-operation of an engineer from the Canadian section of the commission, to locate and mark the international boundary in the international tunnels at Sarnia and Windsor, and on the Ambassador international bridge between Detroit and Sandwich; to mark the boundary on the bridges across the Niagara river, where the locations had already been made in 1927; to repair certain monuments on the Quebec-Vermont boundary and on the St. John river; and to locate and mark the boundary on the international bridges across that river.

The Canadian section undertook to complete the reopening of the boundary vista and the repairing of the monuments on the southwest and south lines of the Quebec-Maine boundary.

Due largely to unusually favourable weather the Canadian party on the Quebec-Maine boundary was able to complete this work by the end of August.

In addition to the above the Department of Marine and Fisheries on behalf of the commission installed lights on the boundary range marks at Point Roberts. These marks range the first course of the boundary in the strait of Georgia and were erected in 1928, in the interests of the fishing industries of both countries.

In July, 1929, a conference was held in Ottawa between members of the staffs of the two sections of the commission. At this meeting certain final details for the joint report on the Ontario-Minnesota section of the boundary were decided upon and a division of the work of computation for the joint report on the 49th parallel boundary was made.

Copy for the report on the Ontario-Minnesota section of the boundary was put into the hands of the printers.

During the year fourteen boundary maps were printed and signed by the commissioners.

Survey data, photographs, maps and other information regarding the boundary were supplied to the Topographical Survey, the Geodetic Survey, the Geological Survey, the Natural Resources Intelligence Service, the Department of

State for External Affairs, the Department of National Revenue, the Department of Public Works, the Railway Commission; various departments of the provinces of New Brunswick, Ontario, and British Columbia; the War Office, London; and to a large number of hydro-electric and mining corporations, engineers, publicists, and private persons.

The office work of the staff during the year has been largely devoted to supplying the information above mentioned, to adjusting survey data, computing geographic positions, making triangulation sketches, and doing other related work in preparation of a joint report on the 49th parallel section of the boundary. Work was also done in completing the maps of the Ontario-Minnesota section of the boundary.

AERIAL SURVEYS DIVISION

The Aerial Surveys Division of the Surveys Bureau was organized a little over a year ago to assist the Director General in carrying out the departmental air program as approved by the Departmental Air Committee and Sub-Committee. Aerial photography and surveying have changed radically in their character during the last few years. During the early stages of the work attention was chiefly concentrated on working out efficient methods of aerial mapping. This phase of aerial surveying has since been placed on a production basis. At the same time a wide field in the application of aerial photography and aerial surveying to engineering problems, to the study of water-powers, forestry, geology, and to geodetic reconnaissance has been opened up. The Aerial Division of the Surveys Bureau gives special attention to these new developments and provides an experienced staff whose services are available to all interested branches and departments.

The work of the Aerial Surveys Division, therefore, included in the first instance, the administrative work in connection with allocation of aircraft and equipment, the preparation, checking, and amending of instructions for photographic operations, the receipt, inspection and transmission of aerial photographic prints and, in general, keeping in constant contact with the various branches and departments using aerial surveys on the one hand and with the Air Force on the other, to insure that the available equipment is used to the best advantage and that it is fairly distributed among the various organizations. These duties require not only constant care and attention but a broad view of the whole aerial situation as it develops during the season. The Aerial Division is in fact the chief point of contact between the Civil Air Force and all the various organizations which it serves in this field.

On the technical side of the work, the services of the staff are always available to advise and assist the different branches and departments in the utilization of aerial methods to meet their particular requirements. During the past year several major developments in aerial surveying have been originated by this division. These include the application of aerial methods to geodetic transportation and reconnaissance, a development which is of the greatest value in extending and speeding up geodetic operations. Experiments in connection with the national inventory of forest resources are now under way which promise to be an important factor in that great undertaking. A third new field of operation, also in course of development is the use of aerial photographs for hydrographic surveying, experimental work for which is now being undertaken in co-operation with the Hydrographic Survey.

In addition to work in connection with other departments there are numerous calls and requests from corporations and private individuals who look to this office for advice in connection with aerial work. In this connection several articles and addresses were prepared for presentation to the Engineering Institute, and other organizations.