CANADA
DEPARTMENT OF MINES
HON. T. A. CRERAR, MINISTER; CHARLES CAMSELL, DEPUTY MINISTER

MINES BRANCH
JOHN McLEISH, DIRECTOR

The Canadian Mineral Industry in 1935

Reviews by the Staff of the Mines Branch

OTTAWA
J. O. PATENAUDE, I.S.O.
PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
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NOTE: Statistical data relating to production, except where noted otherwise, were obtained from published data by the Dominion Bureau of Statistics. Imports and exports are taken from the "Trade of Canada," as issued by the Dominion Bureau of Statistics, and cover the calendar year. Market quotations are obtained from standard marketing reports issued in New York, London, or elsewhere.

1. ALUMINIUM IN 1935

Ores Mined and Producing Localities

The primary ore of aluminium is bauxite; this ore has not been found in Canada in commercial quantities and all requirements for the production of primary metal are usually supplied from the United States, which in turn imports crude calcined ore from both British and Dutch Guiana and also maintains a large domestic production. Canadian trade data also record smaller importations of bauxite from France and re-exports from both Great Britain and Germany; these importations are used in the abrasive and in the chemical trades and not for the production of primary metal. Imported ores have previously been subjected to a preliminary treatment; where the ore is to be used for the production of artificial aluminous abrasives, or for the chemical trade, it is merely calcined to remove excess water; where it is to be used for making fine chemicals or for the production of aluminium metal it is first calcined and then treated by a chemical process to produce nearly pure aluminium oxide. The aluminium oxide used in Canada as a source of metal is prepared in the United States, partly at least from British Guiana bauxites. For the production of metallic aluminium it is also necessary to import both natural and artificial cryolite, a fluoride of aluminium and sodium; the only commercial source of natural cryolite is on the west coast of Greenland, the mining operations being under the indirect control of the Danish Government; artificial cryolite is imported also to be used in conjunction with the natural mineral.

Plans are under way for the construction of a plant at Arvida for the production of pure aluminium oxide from calcined ores; when this plant is in operation it may be presumed that direct shipments of British Guiana calcined bauxite will be resumed.

Important Developments

Aluminium metal and alloys are being used for very many industrial purposes; where their lightness, combined with high tensile strengths, and non-corroding properties make them desirable. The number of alloys commercially available is being expanded by research work and in recent years many new industrial uses have been developed for these alloys. Among the latest applications are structural shapes and sheet metal for railway cars and automobiles, roofing sheets, and shipping barrels; aluminium paints for covering and preserving containers of all kinds, including tank cars, oil storage tanks and water tanks; aluminium foil, specially prepared, offers a new and very efficient insulating covering for hot or cold pipe-lines, refrigerator linings, furnace jackets, and similar applications. More recently the metal in sheet form has been used extensively on passenger boats for bulkheads and cabin construction to reduce fire hazards; many types of containers for the dairy industry have been designed; aluminium foil is also finding many new applications as a wrapper for food products; many new uses have been found for tubes and other shapes; alloy pistons with specially developed oxide surfaces to reduce wear are now in very general use.

Production and Trade

Metallic aluminium is produced in Canada in two plants, both located in the province of Quebec, and both operated by the Aluminium Company of Canada; all ores are imported, and most of the metal produced is exported.

Published quotations show that the price in the United States throughout the year varied between 19 and 21 cents per pound for virgin metal.

The world's production of aluminium metal has shown a marked increase in 1935 over the previous year; especially to be noted is the increased production in Russia and the development of extensive projects by Japan. The increased demand for the metal during the year resulted in the liquidation of stocks held over from previous years, and in both Canada and the United States there was a moderate increase in production. In 1935, the Canadian production is reported (by the United States Bureau of Mines) as being 20,556 metric tons, which may be contrasted with a production of 15,500 metric tons in 1934. Most of the metal produced in Canada is exported in ingots to the United States for further fabrication. In addition Canada exports some manufactured goods. The total exports of aluminium products from Canada in 1935 were valued at $10,760,692, which may be contrasted with the valuation of $8,007,642 in the previous year. Canada also imports many varieties of products manufactured from aluminium; these were valued at $4,139,528 in 1935, and $3,362,428 in 1934.

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DEPARTMENT OF MINES, OTTAWA,
FEBRUARY, 1936. (A.W.G.W.)

2. ANTIMONY IN 1935

Ores Mined and Producing Localities

The Consolidated Mining and Smelting Company produces some impure antimony as a by-product in connexion with its silver-refining operations at Trail, British Columbia. However, it is being allowed to accumulate at the smelter.

The silver-lead-bismuth bullion obtained as a by-product in the treatment of the silver-cobalt-nickel-arsenic ores at Deloro, Ontario, contains small quantities of antimony. This lead bullion is exported to the United States for further treatment, but no payment is made for the small antimony content.

Production and Trade

No antimony ore or refined antimony has been produced since 1917, when shipments of 361 tons of ore valued at $22,000 were made; small experimental shipments were made in 1925, 1926, 1927, and 1931; small amounts of refined antimony as well as antimony ores were, previous to 1917, produced intermittently for a number of years in the Maritime Provinces.

Canada's requirements of antimony are supplied from abroad; in 1935 there were imported 926,959 pounds of antimony or regulus valued at $113,072, and 625,432 pounds valued at $45,124 in 1934; and 48,628 pounds of antimony salts valued at $7,947 in 1935, and 42,038 pounds valued at $5,340 in 1934.

Antimony is dependent for its market upon general industrial activity and especially upon the demand from automobile manufacturers, as it is used largely in alloys for storage-battery plates, bearing and babbitt metals, solder, rubber goods, paints, and fixtures.

Although Bolivia and Mexico are important producers of antimony, the bulk of the production comes from China and market conditions are more or less governed by the existing conditions in that country.

The New York price of antimony in 1935 averaged 13·62 cents a pound, as against 8·90 cents in 1934. The monthly average price gradually increased from 14·11 cents in January to 14·25 cents in February and March, then dropped to a minimum of 12·50 cents for June, July, and August, rising to a maximum of 15·32 cents in October and finishing the year at 13·82 cents for December. The daily price rose to a peak of 16·75 cents in October.

The world's production of antimony in 1933 (1934 and 1935 not yet available), as published by the United States Bureau of Mines, amounted to 20,000 metric tons, as compared with 31,600 metric tons in 1929, the highest figure of production since the War years.

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FEBRUARY, 1936. (A.B.)

3. BISMUTH IN 1935

Producing Localities

Refined bismuth was produced in Canada for the first time in 1928. No bismuth ore as such has ever been mined in Canada; a small amount of bismuth is obtained annually as a by-product in the treatment of the silver ores from northern Ontario, and, since 1928, from the lead-zinc ores of British Columbia.

In Ontario, the Deloro Smelting and Refining Company, of Deloro, from the treatment of the silver-cobalt-nickel-arsenical ores of Cobalt and adjoining areas, obtains a lead bullion which contains bismuth as well as some gold and silver; these products are exported to the United States for refining.

In British Columbia, the Consolidated Mining and Smelting Company of Canada completed, in the latter part of 1928, a plant for the electrolytic treatment of bismuth residue obtained from the electrolytic treatment of lead bullion.

Production and Trade

The Canadian production of bismuth in 1935 was 13,797 pounds valued at $13,245; the previous year 253,644 pounds valued at $301,215 was produced. No separate records of exports of bismuth or bismuth salts are available.

The imports of metallic bismuth were 2,048 pounds valued at $1,675 in 1935 and 4,046 pounds valued at $4,864 in 1934. Imports of bismuth salts were valued at $11,613 in 1935 and $22,010 in 1934.

Statistics of the world's production are very incomplete. A fair estimate would put it at between 500 and 800 tons annually. The United States is the principal producer, but the publication of figures is withheld as most of the production is obtained from the plants of two companies: the American Smelting and Refining Company and the U.S. Smelting, Refining and Mining Company. Canada appears to hold second place as a source of supply of bismuth. Other important sources are Germany, Spain, Peru, Mexico, and Japan. Bolivia was for more than a half century the principal source of supply, but in recent years its production has decreased considerably.

Most of the world's supply is obtained from the treatment of lead refinery slime and as a by-product from the mining of gold, tin, and tungsten ores.

Until recent years most of the bismuth has been used in the manufacture of pharmaceutical products; a much larger proportion is now used in the making of so-called fusible or low-melting alloys, as for automatic sprinkler nozzles. Intensive research is being made for new uses.

Potential supplies from various sources very much exceed present demand, but for several years now the price has been well controlled.

The price of bismuth at New York in ton lots remained fixed at $1.10 a pound from January to July, at 90 cents for August and September, and at $1 for the last quarter of the year. In 1934 the price dropped from $1.30 in January to $1.10 in November, averaging $1.23 for the year. For several years the United States price has been maintained a little below the European parity, plus duty.

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FEBRUARY, 1936. (A.B.)

4. CADMIUM IN 1935

Producing Localities

Cadmium is obtained as a by-product in the production of zinc, and in some cases of lead, being present in small amounts in most zinc ores and in some lead ores.

The cadmium recovery plant for the production of metallic cadmium of the Consolidated Mining and Smelting Company, at Tadanac, British Columbia, first started production early in 1928 and has been treating the residue from the zinc refinery.

The zinc refinery of the Hudson Bay Mining and Smelting Company, at Flinflon, northern Manitoba, which started operating in the latter part of 1930, has been producing small quantities of cadmium residue in the form of so-called cadmiun precipitate, which has been stocked for future treatment. In the fall of 1935 this company started the erection of a refinery for the production of metallic cadmium. The new plant is expected to be in operation early in 1936 and will have a daily capacity for treating about 10 tons of cadmium residue, which will be made up partly of current precipitate and partly of accumulated stock, similar to the procedure followed at the Trail plant.

Production and Trade

The Canadian production in 1935 was valued at $441,203; in 1934 the value was $95,665. Canadian production of cadmium is believed to be exported chiefly to Europe, with small amounts to the Orient.

The world's production in 1934 is estimated at 2,300 tons, as against 1,800 tons in 1933 and 1,000 tons in 1932. The chief producing countries are: the United States, Australia (Tasmania), France, Poland, Norway, and Canada.

The possibilities of increased world production of cadmium are great, but the production is limited entirely to by-product recovery from electrolytic zinc and lithopone and is thus dependent on the output of these products.

The market has been more buoyant these last few years owing to the use of cadmium for plating metal for rust-proofing, and to the rapidly increasing use in the production of bearing alloys for the motor industry. Amongst the new alloys that are being introduced are a cadmium-silver-copper bearing, a cadmium-nickel bearing, and a copper-lead-cadmium bearing alloy. A cadmium-copper alloy containing about 1·0 per cent of cadmium is being introduced for high voltage transmission lines, for tramway and railway-trolley wires, for overhead telephone and telegraph lines and other similar uses. Cadmium also finds application in the arts, medicine, and dyeing, etc. It is marketed in metallic form 99·5 per cent pure and better, and as a sulphide.

The price, which had been characterized in previous years by some remarkable fluctuations, remained fixed at 55 cents a pound from 1931 to early in 1935. The price in 1935 rose from 55 cents for January, February, and March to 65 cents for April to August, 70 cents for September, 85 cents for October and November, and $1.05 for December. The average for the year was 70·5 cents a pound. The American product is protected by a duty of 15 cents per pound.

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FEBRUARY, 1936. (A.B.)

5. COBALT IN 1935

Ores Mined and Producing Localities

Virtually all the cobalt produced in Canada has come from the silver-cobalt mining camps at Cobalt, Gowganda, and South Lorrain in northern Ontario. The greater part of it is obtained as a by-product of silver mining, consequently production varies more or less in accordance with activity in the latter. A certain amount of ore is, however, mined chiefly or solely for its cobalt content.

The only plant in Canada treating ores for the recovery of cobalt is that of the Deloro Smelting and Refining Company, Ltd., at Deloro, Ontario, which produces cobalt metal, oxides, and salts, chiefly for the British market. A considerable portion of the ore produced in Canada is sold for treatment abroad.

Small amounts of by-product cobalt are said to be recovered in Europe from the refining of Canadian nickel-copper matte, but these are not recorded in Canadian statistics.

Prospective Producing Localities

There are no known occurrences of cobalt in Canada, outside of the silver-cobalt camps of northern Ontario, that give promise of commercial importance. A stable high price for silver would probably result in renewal of operations at some of the old silver mines high in cobalt and thus increase the cobalt output.

Production and Trade

Production of cobalt in Canada in 1935 was 679,943 pounds valued at $512,224; in 1934 it was 594,671 pounds valued at $592,497.

Imports of cobalt oxide were 160 pounds valued at $173 in 1935 and 362 pounds valued at $261 in 1934; exports of cobalt in ore, metallic cobalt, oxides, salts, and alloys were valued at $541,554 in 1935 and $614,364 in 1934.

During the year there was an increase in the demand for cobalt and its products, resulting in the re-entry of the Deloro Smelting and Refining Company as buyer in a market that has been far from active, and an increase in the Canadian output from 594,671 pounds in 1934 to 679,943 pounds in 1935. The value of the output in 1935 was, however, only $512,224 as compared with $592,497 in 1934, indicating that increased volume of output has been accompanied by a considerable decrease in price.

It is reported that during the year the Cobalt Association—consisting of Union Minière du Haut-Katanga, Deloro Smelting and Refining Company, Rhokana Corporation, and Minière de Bau-Azzer et du Craara (Morocco)—had signed a trade pact with the Association of German Cobalt Producers regarding the marketing of cobalt and cobalt salts.

The largest part of the world's requirements of cobalt are now filled by extensive African deposits in Belgian Congo, Rhodesia, and Morocco.

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FEBRUARY, 1936. (A.H.A.R.)

6. COPPER IN 1935

Ores Mined and Producing Localities

British Columbia produces low-grade copper ores which require concentrating before smelting; the concentrate is either exported as such or is first smelted, the resulting blister copper being exported for refining. Manitoba copper-zinc ores are concentrated to separate the two metallic sulphides present; the copper concentrate is smelted, and the resulting blister copper is shipped to Quebec for refining. Ontario copper-nickel ores are processed within the province for the production of either matte or blister copper; one firm ships nickel-copper matte to Norway for refining, the other ships part of its nickel-copper matte to the United States and to England for the monel metal industry and also produces blister copper that is refined in Ontario. Quebec sulphur-copper-zinc ores are concentrated for the separation of pyrites, copper-bearing concentrate, and zinc-bearing concentrate; one company exports copper concentrate; the bulk of the Quebec production of copper-gold ores is smelted and refined within the province.

Important Developments and Prospective Producing Localities

In British Columbia the Britannia mine continued milling about 65,000 tons per month or one-third capacity, the ore-bodies being mined containing a higher than average gold and zinc content, the copper concentrate being shipped to Tacoma, Washington, and the zinc concentrate to Japan; operations at Anyox were permanently discontinued on August 1, 1935, and subsequently the surface plant was sold to the Consolidated Mining and Smelting Company for dismantling and use at other properties. As there has been no copper smelter at Trail for several years, British Columbia has now ceased to smelt its own copper ores.

The Flin Flon copper-zinc mine on the boundary line between Manitoba and Saskatchewan has greatly increased its ore reserve and also increased its output of copper during 1935 by about 32 per cent, with a production of approximately 25,000 tons of blister copper; the smelter continued operating at full capacity, the blister copper produced being shipped to the Montreal East refinery. The Sherritt-Gordon property remained inactive, awaiting further improvement in the prices of base metals.

In Ontario, the copper and nickel mines of the Sudbury district produced 126,000 tons of copper, an increase of 22·9 per cent over that for 1934. The International Nickel Company continued the sinking at the Creighton mine of the new large No. 5 vertical shaft which is down to about 2,600 feet and is being extended to the 4,250-foot horizon; the new underground shaft from the 2,400-foot level of the Frood mine has been extended to the 3,500-foot horizon; the Copper Cliff smelter with its four new converters put in operation in December, 1934, giving now a battery of 12 converters, was operated to capacity; the Coniston smelter was also operated regularly, treating mainly Creighton ore for the production of monel metal matte. Announcement has recently been made that the company has appropriated $8,700,000 for further large extensions, including a new copper smelter with two reverberatory furnaces and additions to the concentrator, increasing its capacity from 8,000 to 12,000 tons a day. The Falconbridge new 5-compartment shaft, located 2,500 feet east of the present main shaft, has been extended beyond the 1,500-foot level and connects at the 500-foot and the 1,500-foot levels with the older workings. The potential output of the mine has thus been greatly increased and further enlargement of the surface plant is likely to be proceeded with in the near future. The Falconbridge smelter was operated at full capacity throughout the year. The Cuniptau, a new copper-nickel property, situated near Timagami, which had been under development during 1934, operated a small smelter for a short time early in 1935, then ceased operation.

In Quebec, the Noranda mine and smelter were operated at normal rate throughout the year, and sinking of the new No. 5 shaft was started early in 1935; the Aldermac mine ceased milling in the fall of 1934, pending refinancing for the proposed enlargement of the mill to 1,000 tons a day and the erection of the new sulphur plant; operations may be resumed at the Aldermac early in 1936; the Eustis mine, in southern Quebec, continued in regular operation, exporting its copper concentrate to the United States.

The refinery of the Ontario Refining Company at Copper Cliff, Ontario, and that of the Canadian Copper Refiners, Limited, at Montreal East, Quebec, were both operated at their annual nominal capacities of 120,000 tons and 75,000 tons, respectively.

In 1935, the International Nickel Company undertook the construction of a Research Laboratory at Copper Cliff to help toward the development of new uses for copper.

Exploration for new properties and development work on prospects remain very restricted owing to the present economic conditions. Nevertheless, the vigorous exploration by Consolidated Mining and Smelting Company of the gold-copper showings on Doré lake, Chibougamau district, about 170 miles west of lake St. John, was continued in 1935.

Production and Trade

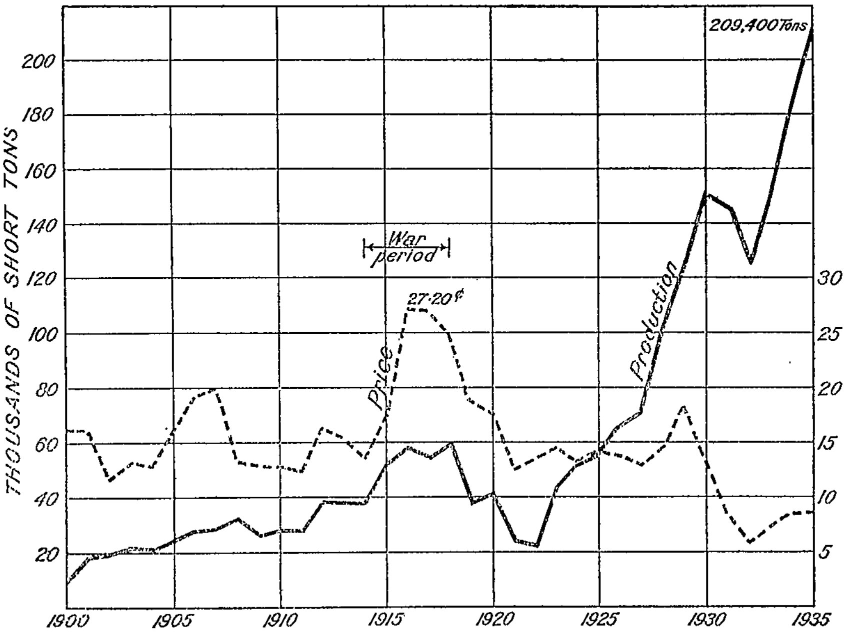
The total Canadian production in 1935 was 419,874,920 pounds, valued at $32,380,343; in 1934 the production was 364,761,062 pounds, valued at $26,671,438. Of the total production in 1935, Ontario contributed 60 per cent, Quebec 19·1 per cent, Manitoba and Saskatchewan 11·8 per cent, and British Columbia 9·1 per cent.

Exports were:	Pounds	$
Copper fine in ore, matte, etc.	38,702,700	1,870,542
Copper blister	73,356,300	5,589,624
Copper in ingot, bar, rod, etc.	243,535,200	18,061,278
Copper old and scrap	6,327,400	360,000
Copper in rod, strip, sheet, plate and tubing	36,516,100	3,065,480
Copper wire and cable	....	469,552
Copper manufactures	....	245,221
		29,661,697

Imports were:	Pounds	$
Copper in bar, rod, block, pig, ingot, tube, wire, and scrap	1,495,749	243,190
Copper manufactures and compounds	....	593,426
		836,616

Owing to the special revenue tariff of 4 cents a pound, sales of Canadian refined copper in the United States have ceased since 1933; concentrate shipped to the United States, chiefly from British Columbia, but also from Quebec, was treated in bond, the recovered metal being all offered for sale in other markets. On account of its excellent quality Canadian refined copper is much in demand by foreign buyers and is finding its way into ever-widening markets. Canadian producers in most cases have the advantage of producing copper more or less as a by-product in the recovery of gold and silver, nickel, or zinc.

The beginning of 1936 finds the world's copper industry in a better condition than at the beginning of any of the four previous years. The progressive improvement from the standpoint of consumption, price, and reduction of excessive stocks was even more noticeable than in the previous year.



Copper production and price trends in Canada, calendar years 1900-1935.

By the end of 1935 the world's copper stocks were reported as slightly in excess of normal requirements and the steady growth of the demand for copper makes the outlook for 1936 the brightest for the copper industry since the depression.

The world's consumption during the depression reached its lowest point (980,000 tons) in 1932, as compared with the high point of 1,880,000 tons in 1929. The tide turned in 1933, and by 1934 the consumption was reported at about 1,350,000 tons, while for 1935 it is estimated to have exceeded 1,500,000 tons. As most of this improvement has been due to increased consumption in Great Britain, Germany, and Japan, the prospects of trade recovery in the United States would add considerably to the possibilities of further expansion of the demand for copper in 1936.

As the greater part of Canadian refined copper goes to Great Britain, it is interesting to note that the copper consumption in the United Kingdom in 1935 was at the rate of approximately 245,000 tons annually, as against about 220,000 tons in 1934. The increase is attributed mainly to the expansion in house building, the improvement in the transportation and engineering industries, and to the continued increased use of electricity in the homes.

As the United States is by far the largest consumer of copper, it is of interest to note the principal industries using copper in that country. They are by order of importance: the electrical, automobile (100,000 tons), building (75,000 tons), and mechanical refrigerator (25,000 tons) industries; the air-conditioning industry, a new industry still in its infancy, is expected to consume large quantities of copper.

The world's production in 1935 is estimated at 1,504,000 tons as against 1,382,000 tons in 1934, and 987,000 tons in 1932. The highest production was 2,118,200 tons in 1929. Canada in 1935 contributed 15 per cent of the total world's production.

The New York price of domestic electrolytic copper averaged 8·649 cents a pound in 1935, as against 8·428 cents in 1934. Owing to the 4 cents duty there is a differential between the foreign and the domestic price.

The outstanding event in 1935 was the signing in March in New York of the copper restriction agreement. The agreement, which has been participated in by all of the world's principal producers, has six salient clauses, the principal being a curtailment in output in countries outside the United States which are producers and also exporters, at the rate of 240,000 tons per annum, to be made effective from June 1, 1935. Canada was to maintain her current output of refined copper and to store any increase of mine output in the form of matte or blister. The agreement terminates on July 1, 1938.

ISSUED BY THE MINES BRANCH,
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FEBRUARY, 1936. (A.B.)

7. GOLD IN 1935

Important Developments and Prospective Producing Localities

The chief sources of gold in Canada in 1935 were, as for many years past, the gold quartz mines of Porcupine and Kirkland Lake camps in northern Ontario. The proportionate amount contributed by the combined production of these two camps in 1935—a little over 58 per cent—was, however, smaller than in previous years.

Nearly all Ontario's gold comes from gold-quartz mines, with a substantial contribution of by-product gold from the nickel-copper mines. Quebec's output comes chiefly from the Noranda gold-copper mine, supplemented by steadily increasing amounts from a number of gold-quartz mines in the northwest part of the province. In British Columbia, gold-quartz mines, of which Pioneer, Bralorne, and Premier are the most important, contribute most of the output; a certain amount comes also from base-metal mines, largely from the Britannia gold-copper-zinc mine; and also a small but increasing amount from placers. Manitoba's gold is chiefly by-product or co-product metal from the Flin Flon copper-zinc mine, though the output of the gold-quartz mines is of steadily increasing relative importance. Saskatchewan's output is still derived entirely from the Flin Flon mine. The Yukon output is virtually all placer; as is also the few ounces reported from Alberta. Nova Scotia's production is all from gold-quartz veins.

The relative amounts contributed by the various provinces in 1935, are as follows:—

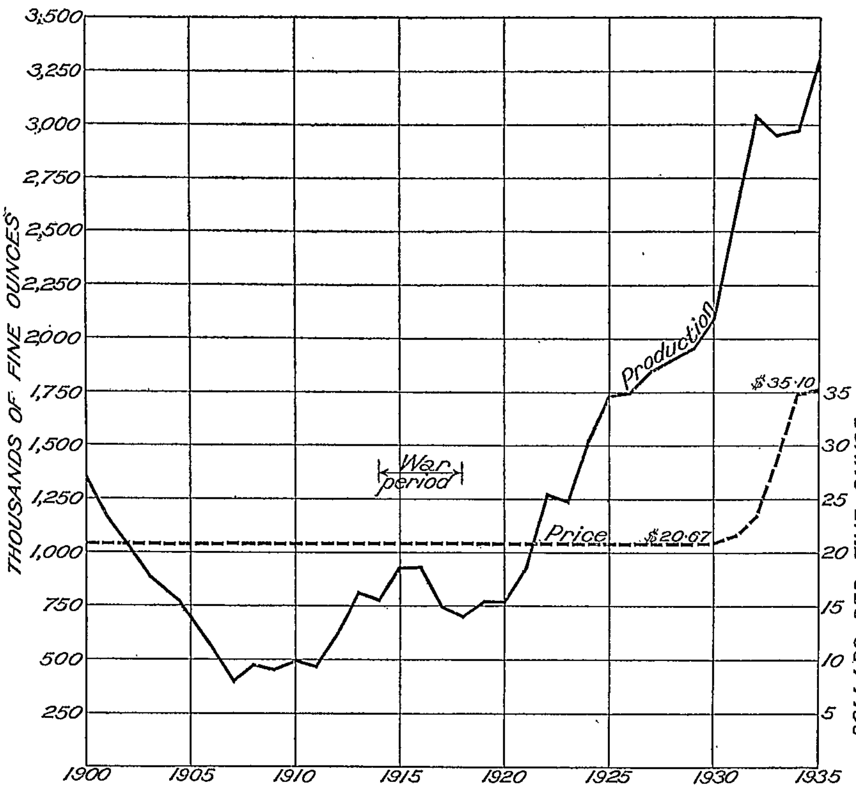
	Fine ounces	$*
Nova Scotia	9,328	328,252
Quebec	470,471	16,555,874
Ontario—		
Porcupine	968,436	34,199,065
Kirkland Lake	948,020	33,437,428
Other	303,715	10,491,324
Total Ontario	2,220,171	78,127,817
Manitoba	145,469	5,119,054
Saskatchewan	11,934	419,957
Alberta	150	5,279
British Columbia	389,690	13,713,191
Yukon	35,708	1,256,565
Northwest Territories	200	7,038
Canada	3,283,121	115,533,027

*Estimated values in Canadian currency.

Plants for the production of fine gold are operated by: the Royal Mint, at Ottawa; the Hollinger mine at Timmins, Ontario; the Ontario Refining Company, at Copper Cliff, Ontario; Canadian Copper Refiners, at Montreal East, Quebec; and the Consolidated Mining and Smelting Company, at Trail, British Columbia.

Important Development and Prospective Producing Localities

Though the discovery of no new goldfields of major importance was reported in 1935, activity in the development of properties in the older districts continued with unabated vigour with, on the whole, satisfactory results. Some thirty-four new mills are reported to have been brought into production during the year, most of them quite small. Among the larger are a 500-ton mill on Lamaque, one of 300 tons on Canadian-Malartic, and one of 180 tons on the Arntfield mines, in Quebec. In the same province, Beattie mine increased milling capacity from 1,200 to 1,400 tons; and it is proposed to build and bring into production in 1936 a 200-ton mill on Stadacona and a 100-ton mill on Shawkey mine.



Gold production and price trends in Canada, calendar years 1900-1935.

In Ontario, 150-ton mills were put into production on the Pickle-Crow and McKenzie Red Lake mines in 1935; and one of 300 tons on the Omega, formerly Associated Goldfields, at Larder Lake early in 1936. Among projected mills particular interest attaches to that for which preparations are now being made on the Pamour mine in the Porcupine camp. It is also worthy of note that production in a small way has been revived in two of the oldest gold districts in the province, viz.—the Lake of the Woods, in northwestern and around Madoc and Marmora in southeastern Ontario.

In Manitoba, a 150-ton mill was put into production on God's Lake mine and one of the same capacity on the Gunnar is expected to be in operation before midsummer, 1936.

In British Columbia, 11 new mills are reported to be operating, the largest—on Ymir Consolidated and Sheep Creek mines—being of 150 tons daily capacity each; 100-ton mills were put in operation on Surf Inlet Consolidated, Meridian, and Violet mines. Mills of 150 tons daily capacity are projected on the Hedley Amalgamated and Hedley Mascot mines.

In Nova Scotia the extensive campaign of exploration and development being carried out at Caribou Mines is of especial interest.

Production

In 1935, Canada's gold production was the greatest in her history, both in amount and value. Output totalled 3,283,121 fine ounces which at the average price of gold for the year ($35.19 an ounce) was worth $115,533,027. This compares with 2,972,074 fine ounces worth $102,536,553 in 1934, when the average price was $34.50 an ounce; and with 3,044,387 fine ounces in 1929, the previous year of record production. With a number of new mills scheduled to come into operation and with the tendency to mill lower grade ore rather than increase output having apparently reached its limit, production in 1936 will probably set a new record.

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DEPARTMENT OF MINES, OTTAWA,
FEBRUARY, 1936. (A. H. A. R.)

8. IRON IN 1935

Producing Localities

No iron ore has been mined in Canada for a number of years. There are, however, three large iron and steel-making plants and one merchant furnace in operation on imported ore. The Dominion Steel and Coal Corporation's plant at Sydney, Nova Scotia, depends on mines at Wabana, Newfoundland, for its iron ore; while the plant of the Steel Company of Canada, at Hamilton, Ontario, that of the Algoma Steel Corporation at Sault Ste. Marie, Ontario, and the Canadian Furnace Company's blast furnace at Port Colborne, Ontario, all draw their supplies from the Lake Superior region of the United States.

Production and Trade

The production of pig iron in Canada in 1935 was 599,794 long tons; in 1934, 404,995 long tons were made.

Imports of iron and its products (including iron ore to the value of $2,960,207 in 1935 were valued at $112,136,244, of which $86,473,621 came from the United States and $20,407,113 from Great Britain; exports were valued at $50,027,165 of which $4,781,052 went to the United States and $11,297,451 to Great Britain.

Bounties on the production of pig iron from domestic ore are offered by three Canadian provinces—Ontario, Quebec, and British Columbia—but have not produced the hoped-for result, viz., the establishment of an iron-mining industry, as there are, in so far as is known, no large bodies of domestic ore of suitable grade available to Canadian furnaces. There are, however, two large partly developed, but unequipped deposits of low-grade ore in Ontario. The Algoma Steel Corporation's New Helen mine in the Michipicoten district has proved reserves variously estimated at 60,000,000 to 80,000,000 tons of rather sulphury iron carbonate that requires roasting to fit it for use in the blast furnace. A similar ore was formerly worked by the same company at Magpie mine, also in the Michipicoten district, but this is not at present profitable. In the Sudbury district, Moose Mountain, Ltd. has developed some 33,000,000 tons of proved and probable ore consisting of low-grade siliceous magnetite carrying in its natural state about 35 per cent of iron. For a time—in the past—an attempt was made to work the Moose Mountain ore by a process of magnetic separation and sintering, but in spite of the exceptionally high grade of the finished product it was found impossible to bring costs down to the point where a profit could be made in competition with available natural ores of foreign origin.

ISSUED BY THE MINES BRANCH,
DEPARTMENT OF MINES, OTTAWA,
FEBRUARY, 1936. (A. H. A. R.)

9. LEAD IN 1935

Producing Localities

The greater part of the lead produced in Canada for several years has come from the great Sullivan silver-lead-zinc mine at Kimberley, British Columbia. Other important producers in British Columbia have been the Monarch silver-lead-zinc mine near Field, and numerous silver-lead and silver-lead-zinc mines in the Kootenay district and other parts of British Columbia.

In the Yukon Territory, high-grade silver-lead mines have been operated in the Mayo area. In Ontario, the production came from the Galetta lead-zinc mine, which has been idle for several years. In Quebec, the production has been derived from the lead-zinc mines near Notre-Dames-des-Anges, Portneuf county, and in Nova Scotia, from the copper-lead-zinc mine at Stirling, Cape Breton.

Important Developments and Prospective Producing Localities

In British Columbia the Sullivan mine, with its 6,000-ton concentrator, produces the greater part of the Canadian lead. The Monarch mine, near Field, is an important contributor exporting to Europe both the lead and zinc concentrates produced. In addition, during 1935 several of the properties in the Slocan and Ainsworth divisions of West Kootenay resumed operations after a few years of idleness. Amongst these might be mentioned the Mammoth near Silverton, the Noble Five and Rambler near Sandon, and the Whitewater near Kaslo. All of these operate their own concentrating plants.

In the Yukon Territory, the Treadwell Yukon Company continued producing from its small but high-grade silver-lead properties near Mayo.

In Quebec, the Tetreault property near Notre-Dame-des-Anges was restarted in June, 1935, after several years of idleness and the company was shipping lead and zinc concentrates to Europe.

In Nova Scotia, the Stirling property in Cape Breton was being prepared for production early in 1936.

The lead smelter and electrolytic lead refinery at Trail, B.C., is the only one in Canada and has a capacity of 475 tons of refined lead a day, or 170,000 tons a year.

Production and Trade

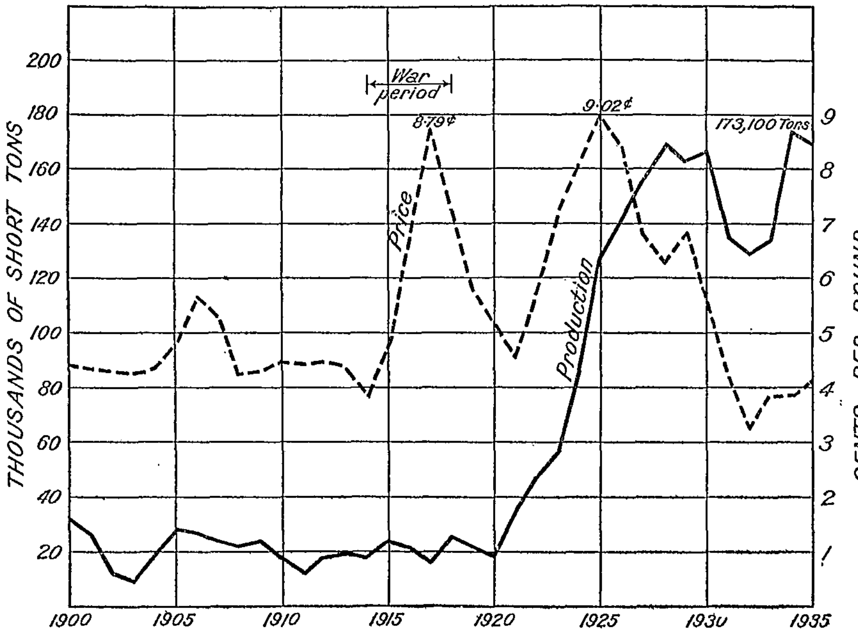
The Canadian production of lead in 1935 was 339,089,296 pounds valued at $10,624,278, as against 346,275,576 pounds valued at $8,436,658 in 1934.

The total imports of lead and lead products in 1935 were valued at $1,568,043, as compared with $1,371,686 in 1934.

The exports of lead in ore, pig, etc., were 294,218,600 pounds valued at $7,161,424; in the previous year the exports were 306,803,800 pounds valued at $5,747,709.

Canada contributed about 11 per cent of the world's lead production in 1935, which is estimated at 1,570,000 tons. The principal producing countries are, in order of importance, United States, Australia, Mexico, Canada, Germany, Burma (India), and Spain.

There has been a noticeable improvement in consumption since 1932. In the United States the principal consuming industries continue to be, the lead pigment industry and the storage battery industry; the cable industry, which in 1929 and 1930 consumed more than any other, is still occupying a low position; the outlook for increased consumption of lead in 1936 is quite encouraging.



Lead production and price trends in Canada, calendar years 1900-1935.

In the United Kingdom consumption of lead for the last three years has been increasing annually and is much in excess of that for the year 1929; the chief influence continued to be the further advance in building activity.

In Canada the consumption of lead in certain specified manufacturing industries amounted in 1933 to about 16,000 tons, in 1930 it was 31,600 tons; data are not yet available for 1934 and 1935.

The average price of pig lead at Montreal in 1935 was 3·9 cents a pound, as against 4·5 cents in 1934; the monthly price increased from 3·25 cents in January to 4·65 cents in December. The quotations on the London market, transferred to Canadian funds, average for the year 3·15 cents as against 2·44 cents in 1934. The average price at New York was 4·065 cents as against 3·860 cents in 1934.

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FEBRUARY, 1936. (A.B.)

10. MANGANESE IN 1935

Ores Mined and Producing Localities

The production of manganese ore in Canada has been small and irregular and has been confined mainly to Nova Scotia and New Brunswick with occasional shipments from British Columbia.

The manganese ores, which have been mined in eastern Canada, are pyrolusite, manganite, psilomelane, and bog manganese. These, with the exception of the bog manganese, were mostly ores with a high manganese content and fairly free from deleterious constituents. They were usually in small lots and were derived from various localities in Nova Scotia, New Brunswick, and British Columbia.

Production and Trade

The production of manganese ore in Canada in 1935 was 100 tons valued at $800. There was no production during the previous three years.

The imports of "manganese oxide" in 1935 were 36,780 tons valued at $353,414, as against 30,953 tons valued at $234,236 in 1934.

The manganese ore imported into Canada comes mainly from the Gold Coast, West Africa. Important quantities are also imported from British South Africa and from the United States. The ore is principally used in the making of ferromanganese. Notwithstanding the duty of nearly 2 cents per pound of metallic manganese in ferromanganese of a grade of 30 per cent or more, most of the Canadian ferromanganese is exported to the United States and these exports in 1933 were 60 per cent of the total imports of ferromanganese into the United States, this situation being due to the fact of Canada's great supply of hydro-electric power.

The world's production of manganese decreased from 3,573,000 metric tons in 1929 to 1,300,000 metric tons in 1932. A noticeable improvement started during the last half of 1933 and continued throughout 1934 and 1935.

Russia is by far the largest producer, followed by British India, the Gold Coast of West Africa, Cuba, Japan, Union of South Africa, Brazil, and Egypt.

The price of manganese ore at North Atlantic ports for 46 to 48 per cent manganese, Brazilian, remained fixed at 24 cents per unit for the whole of 1935; for chemical grades, 80 per cent MnO_2, the price throughout the year was $40 to $45 a ton.

The United States Tariff Act of 1930 provides for a continuance of the duty of 22·4 cents per unit on manganese ores down to 10 per cent of metallic manganese.

In the Canadian trade agreement with the United States made in 1935, the duty on ferromanganese entering the United States from Canada was reduced from $1\frac{7}{8}$ to $1\frac{5}{8}$ cents a pound on the manganese content of ferromanganese containing not less than 4 per cent of carbon.

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FEBRUARY, 1936. (A.B.)

11. MOLYBDENUM IN 1935

Ores Mined and Producing Localities

No commercial production took place.

Important Developments and Prospective Producing Localities

Ontario. The Phoenix Molybdenite Corporation, Toronto, carried out extensive prospecting on its property in Bagot township, 8 miles southwest of Renfrew. The shaft was sunk to 100 feet, from which depth about 1,000 feet of drifting and cross-cutting was undertaken. The main ore zone, previously worked by opencut methods, was found at depth and some rich pockets of molybdenite were discovered. Underground diamond drilling was started at the close of the year. About 1,000 tons of milling ore was hoisted and placed in the storage sheds awaiting future concentration.

Prospecting was continued by A. V. Dukes on the molybdenite property near Mace, Steele township, Cochrane district. The vein has been uncovered for 500 feet with an average width stated to be 6 feet and has been traced for 1,200 feet.

Quebec. Prospecting was continued under the direction of H. H. Claudet of Ottawa on the Bain property in Masham township, about 36 miles north of Ottawa. New showings of molybdenite were exposed and a shaft was sunk 25 feet in the ore-body.

Two miles west of Portneuf station, 40 miles west of Quebec, a small amount of prospecting was carried out on the deposit discovered during the previous year that is exposed along the Canadian National railway track.

Production and Trade

Canada imported 74,994 pounds of calcium molybdate in 1935 for use in the manufacture of steel alloys, valued at $26,192; in the previous year the imports were 35,187 pounds valued at $15,586.

The world total production for the year is estimated to be approximately 6,600 tons of metallic molybdenum. The United States contributed about 5,680 tons, which is almost 1,000 tons greater than in 1934, and constitutes an all-time record. The Climax Molybdenum Co., at Climax, Colorado, continued to be the leading producer with much the same output as in 1934, which amounted to the equivalent of about 4,150 tons of the metal, while a substantial output was maintained by the Molybdenum Corporation of America, near Questa, New Mexico.

The largest production outside the United States comes from Cananea in Mexico, which in 1934 had an output of high-grade molybdenum sulphide concentrate containing 467 tons of the metal. The Knaben mine in Norway increased its output, which now amounts to about 700 tons of molybdenite concentrate a year. Several other companies were active in Norway. Production was also maintained from the Azegour district in French Morocco and in 1934 amounted to 150 tons of 85 per cent MoS_2 concentrate. In Australia, there are several very small producers distributed throughout New South Wales, and one in Queensland. A few tons are also being produced from Peru and Korea.

Molybdenum is chiefly used in combination with other alloying metals, particularly nickel, chromium, and vanadium. The extended use of molybdenum in many fields has caused a considerable increase in consumption. In several industries, such as oil-refining machinery and in steam plants, molybdenum steels are replacing other materials and in some instances replacing tungsten in the high-speed steel industry. For use in hard-wearing and special parts, carbon-molybdenum steels are gaining favour both on the American continent as well as in Europe. The application of molybdenum in cast iron has greatly increased since it was first thus employed in 1929. A considerable amount of molybdenum wire and sheet is used in the radio industry. Amongst the newer uses are molybdenum pigments and also for producing certain deposits on metals, thus replacing to some extent electrolytic methods. Molybdenum is introduced into steel either as calcium molybdate or as ferromolybdenum, particularly the former; the proportion used being about 4 to 1.

The price at New York of 85 per cent molybdenite concentrate is nominally 42 cents per pound of contained molybdenum sulphide. The duty on ore or concentrate into the United States is 35 cents per pound on the metallic molybdenum contained therein. Calcium molybdate is about 87 cents and ferromolybdenum $1 per pound of contained molybdenum, f.o.b. Montreal.

Activity in molybdenite prospecting and mining increased appreciably throughout the world during the year. There were a considerable number of inquiries for Canadian material, but these, however, call for regular tonnage of a consistent grade of concentrate over fairly long periods. Owing, therefore, to the comparatively small size of the great majority of Canadian molybdenite deposits, regular sales are more likely to be effected through some form of co-operation or amalgamation rather than by the small individual producers in competition with one another.

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FEBRUARY, 1936. (V.L.E-W.)

12. NICKEL IN 1935

Ores Mined and Producing Localities

Nearly all Canada's nickel is derived from the nickel-copper ores of the Sudbury district, in Ontario; though a small amount also is recovered, as a by-product, from the silver-cobalt ores of Cobalt and similar camps in the northern part of the same province.

Proved ore reserves of the International Nickel Company of Canada, Ltd., the chief producing company, alone amount to well over 200,000,000 tons. This company's chief mines, Frood and Creighton—from which most of the production at present comes—are the two largest known nickel deposits in the world. The Frood mine alone, though only partly explored, is known to contain over 125,000,000 tons.

Important Developments and Prospective Producing Localities

The three-year development plan for International Nickel Company's Frood and Creighton mines, decided on in 1933, was continued throughout 1935, and is being rushed to completion so as to synchronize with plans now underway for increasing ore treatment capacity. Construction of a new smelter unit to cost $6,000,000, which will include two new reverberatory furnaces, eight new converters, and a new 510-foot chimney, is now in progress. This when completed, probably by the end of 1936, will increase smelting capacity by about 40 per cent. The capacity of the concentrator is also being increased for the treatment of 12,000 instead of 8,000 tons of ore a day; and a research laboratory is to be built at Copper Cliff in addition to those already in operation at Bayonne, New Jersey, U.S.A., and Birmingham, England. A plant for the manufacture of monel metal hot-water tanks was established at Port Colborne about the end of the year by Whitehead Metal Products of Canada, Ltd., a wholly owned subsidiary of the International Nickel Company.

Falconbridge Nickel Mines, Ltd. completed the sinking of its new No. 5 shaft to a depth of 1,450 feet for the purpose of opening up its east ore-body. The capacity of its concentrator was increased from 260 to 400 tons of ore a day in August.

The B.C. Nickel Company continued the exploration of its nickeliferous pyrrhotite deposits on Emory creek, near Hope, B.C., but has made no definite statement of plans for production.

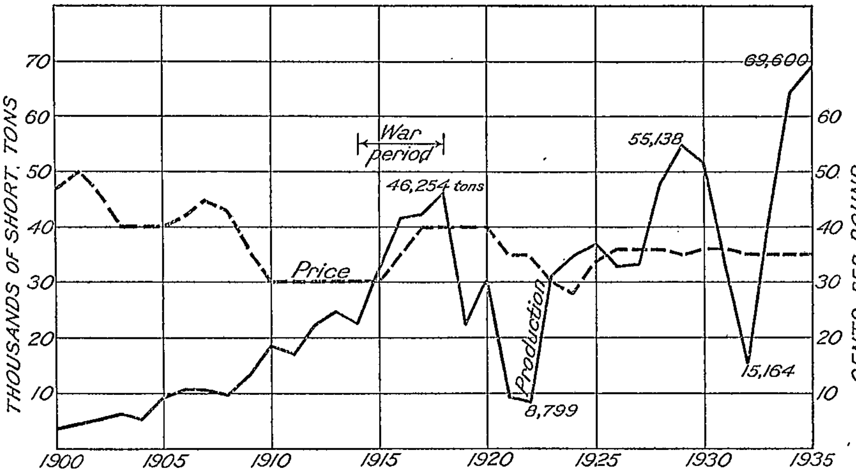
During the year a new company, British Nickel Corporation, was formed in London, England, and acquired options on a number of properties in the Sudbury district.

Production and Trade

Increasing demand for nickel, which has been steadily maintained since the low point in 1932, resulted in 1935 in a Canadian production of 138,516,240 pounds valued at $35,345,103. This figure is about 7 per cent above that of 1934, and the largest ever recorded. Confidence in the future is shown by the preparations being made by the nickel companies for greatly increased output.

Imports of nickel products of all kinds into Canada in 1935 had a value of $1,199,457; as against exports of 142,726,500 pounds of nickel valued at $36,285,482.

Although the increase in consumption in 1935 undoubtedly reflects a tendency of certain world powers to strengthen their reserves of nickel, it is gratifying to note that the great bulk of the metal still goes directly



Nickel production and price trends in Canada, calendar years 1900-1935.

into established peacetime uses. Nickel in one form or another is now virtually essential in the major industries and there are on world markets more than 1,000 trade-marked alloys containing nickel. Sales during 1935 continued to show approximately the same division between American and European consumption as obtained in 1934.

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FEBRUARY, 1936. (A. H. A. R.)

13. PLATINUM GROUP METALS IN 1935

Ores Mined and Producing Localities

With the exception of a few ounces of platinum obtained from the black sands of British Columbia, and a small production obtained as an impure residue in the refining of gold at Trail, B.C., all the Canadian platinum and allied metals are obtained from the treatment of the Sudbury nickel-copper-matte.

The successful development of the Frood and Frood Extension copper-nickel mines near Sudbury has added considerably to the Canadian production of metals of the platinum group, as the ores of these mines contain a notable amount of these metals.

The Acton refinery located at Acton, England, and owned by the International Nickel Company, is an efficient plant designed to treat precious metal residues. In order to provide refining capacity for the large output of platinum metals from the Frood mine, this refinery was enlarged in 1932 to a capacity of 300,000 ounces a year of platinum group metals.

Production and Trade

The Canadian production of platinum in 1935 was 105,355 ounces valued at $3,445,109; in 1934 it was 116,230 ounces, valued at $4,490,763. The production of palladium and other associated metals of the group was 84,772 ounces, valued at $1,962,943 in 1935; the preceding year it was recorded as being 83,932 ounces, valued at $1,699,282. The imports of platinum products in 1935 were valued at $77,898 as against a valuation of $64,023 in 1934. Exports in 1935 were valued at $5,081,518, as against $5,198,691 in 1934; export records do not show the metals of the platinum group present in exported copper-nickel matte.

For the first time in 1934 Canada became leader in the production of platinum, thus displacing Russia, which country had previously held first place. In 1935 Canada continued as the leading producer, being followed in order by Russia, South America (Colombia), and South Africa. Canada also leads the world as the largest producer of palladium. This condition has resulted from the heavy demand for nickel.

The price in New York of refined platinum opened the year 1935 at $34 an ounce. This fixed price gradually dropped to a minimum of $30 in August, then increased to a maximum of $38 in October, at which price it remained to the end of 1935.

All of the platinum metals produced from the Sudbury ores are, after refining at the Acton plant, London, England, sold by the Mond Nickel Co., Ltd., and by their regular distributors throughout the world.

The world's consumption of platinum metals for 1935 is estimated by Baker & Company at about 275,000 ounces, compared with 200,000 ounces in 1934, 175,000 ounces in 1933, and 75,000 ounces in 1932.

The continuous improvement in the consumption of the platinum group of metals is in part due to the improvement in the jewellery trade, which is using increasing quantities of platinum and palladium.

The activity in the chemical industry has led to several new developments and to further inquiry for platinum catalysts and laboratory equipment. Industrial uses of the platinum metals continue to advance, particularly in the rayon manufacturing industry and in the electrical field. In the musical field investigations are proceeding for making flutes entirely of iridium and platinum. Rhodium is finding increased use as a finish for reflectors and for the protection of silverware from tarnish.

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FEBRUARY, 1936. (A.B.)

14. RADIUM AND URANIUM IN 1935

Ores Mined and Producing Localities

Eldorado Gold Mines, Ltd., operating the pitchblende deposits discovered in 1930 at LaBine Point, Great Bear lake, N.W.T., continued to be the only important producer of radium and uranium ore. Small amounts of pitchblende have been found on other groups of claims in the Great Bear Lake field, but, so far, these discoveries have not shown promise of being of any serious economic importance.

The Eldorado Company proceeded with development throughout the year, employing about 65 men. Water transport to the Great Bear Lake field was much improved during the season, the incoming freight handled for the various operators increasing largely. The Eldorado Company, alone, landed over 1,100 tons of supplies and equipment at its mine. Freight costs have been materially cut and are expected to show further reduction. Underground development is at present confined to the main, or No. 2, vein, upon which a shaft has been carried to a depth of 340 feet, with levels opened at 125 and 250 feet below the adit, 90 feet below the highest outcrop, and opening the vein for a length of 1,000 feet east and west of the adit cross-cut; on the 125-foot level, 550 feet of drifting has been done east and west of the shaft; and on the 250-foot level, 400 feet. Rich pitchblende and silver mineralization extends to the depth reached, with local shoots of cobalt and nickel arsenides. It is planned to deepen the shaft 250 feet early in 1936, and to start levels at 375 feet and 500 feet below the adit.

The concentrator treated 65 tons per day by tabling and flotation throughout the year: jigs, classifier, and new tabling and flotation units were installed late in the year and are expected to step up mill capacity to 75 tons. Power is supplied by three Diesel units, furnishing a total of 325 h.p., and using oil from the wells at Fort Norman, on the Mackenzie river.

Important Developments and Prospective Producing Localities

Northwest Territories. Further exploration was undertaken in the last half of the year on the Arden group of claims at Beaverlodge lake, about 100 miles south of LaBine Point, between Great Bear lake and Fort Rae, on Great Slave lake. Rich pitchblende was discovered at this point early in 1934, and a few tons of ore were taken from surface pits by Hottah Lake Mines, Ltd. The company was re-incorporated in 1935 as Hottah Lake Gold and Radium Mines, Ltd., and it is reported that a shaft has been sunk to a depth of 100 feet, from which drifting is being conducted in a search for further ore-bodies. The pitchblende found at surface appeared to be in pockets or lenses in a large quartz dyke and was associated with heavy hematite, whereas at Great Bear lake the pitchblende occurs in definite veins, associated with native silver and cobalt-nickel arsenides.

A few other discoveries of pitchblende of similar character have been made in the Hottah Lake region, but the deposits appear to be small. During 1935 the W. A. Murphy Syndicate, of Calgary, worked on a group of claims at Hardisty lake, some 10 miles southeast of the Arden property, and reported several narrow pitchblende-hematite veins.

The above region lies inland. Water transport is available from Great Bear lake, via the Camsell river, but only for small, light-draught boats, and development will have to depend mainly on aerial freighting.

Saskatchewan. Several small showings of pitchblende were discovered in 1935 on claims of Mineral Belt Locators' Syndicate, near the new townsite of Goldfields, on the north shore of lake Athabaska, during prospecting for gold. A number of pits opened on one claim disclosed a narrow vein carrying cobalt and nickel arsenides with a small pitchblende stringer in some sections; the vein was traced on surface for 200 feet. Pitchblende was also found in similar association on a claim one mile to the southeast. Both occurrences show high-grade pitchblende, a sample stated to come from this property and sent to the Mines Branch for report having yielded, on analysis, 54 per cent U_3O_8. The veins, however, appear to be very narrow and hardly suggest the presence of commercial ore-bodies.

Ontario. The uraninite property of International Radium and Resources, Ltd., at Wilberforce, in Haliburton county has been idle for several years and part of the mining and milling equipment has been removed. Canada Radium Mines continued development throughout the year on its property at Cheddar, 7 miles south of Wilberforce, in pegmatitic rock, in which occur a number of calcite-filled veins: both rock and vein-matter are stated to carry radioactive minerals.

Production and Trade

The Eldorado refinery at Port Hope, Ont., reported 161 tons of ore received from Great Bear lake during 1935, 150 tons being mill concentrate and the rest selected, high-grade crude. Ten per cent was flown out to rail before the spring break-up, the remainder being shipped by water, via the Mackenzie river, between July and September. Total ore production for the year will probably exceed 200 tons, as the above figures do not include ore produced during the last quarter. It is intended to continue regular air shipment of ore during the winter, the company having acquired in 1935 a large 2-ton pay-load airplane. The 1935 production will be much in excess of that of 1934, when 79 tons was produced.

The Port Hope refinery treated 116 tons of ore during the year. The combined value of radium and uranium salts recovered is given at $425,000. Radium is shipped in the form of the bromide salt; the uranium compounds made are principally orange and yellow sodium uranate and uranium oxide. Both crude ore and concentrate contain much native silver, which has been recovered in the form of lead-silver bullion: the value of the combined silver and lead so recovered in 1935 was $75,000. A large part of the lead is "radio-lead," resulting from the atomic disintegration of radium, of which it forms the stable end-product.

The refinery output in 1933 was 3·0 grammes of radium and 34,940 pounds of uranium salts, and in 1934, 3·1 grammes of radium and 27,000 pounds of uranium salts.

Plant process underwent some revision during the year, notably by the introduction of a preliminary salt-roasting of the ore, followed by a hyposulphite leach, designed to effect early and better removal of the contained silver, which will henceforth be recovered in the form of sulphide. The plant now treats one ton of ore per day, and employs 45 men. All of the radium produced is consigned to England for measurement and loading into needles; most of the output of uranium salts is shipped to England and the United States.

Exports and imports of uranium compounds are not shown separately in trade statistics. Radium imported into Canada for medical and scientific use during the last five years has had the following value: 1931, $207,735; 1932, $45,108; 1933, $8,374; 1934, $211,140; 1935, $150,643. The high value shown in 1934 represented largely radium imported on a temporary rental basis, and that for 1935 was mostly Canadian radium sent to London for loading into needles and shipped back.

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DEPARTMENT OF MINES, OTTAWA,
FEBRUARY, 1936. (H.S.S.)

15. SELENIUM IN 1935

Producing Localities

Selenium, although fairly widely distributed, is not very abundant in nature; it occurs in association with sulphur and frequently accompanies the sulphides of heavy metals in the form of selenides; in no case does it occur in quantity large enough to be mined for itself alone. Commercial selenium is recovered from the slime or residue produced in the refining of copper; in Canada it is recovered during the refining of blister copper produced in Manitoba, Ontario, and Quebec.

Important Developments and Producing Localities

It was produced for the first time in Canada in 1931 at the new copper refinery of the Ontario Refining Company, at Copper Cliff, Ontario, where a considerable amount is still being refined annually; it also occurs in association with tellurium in the refinery slime of the Canadian Copper Refiners, Ltd., at Montreal East, Quebec. This latter company, during the first few years of operation, stored its residues for future treatment and began production in November, 1934. Both companies have been in production throughout the year.

Production and Trade

The production of selenium in 1935 was 345,159 pounds valued at $662,705, as against 104,924 pounds valued at $171,311 in 1934. Although most of the production is exported, no separate records of exports of this commodity are published; no imports are recorded.

Canada is now in a position to produce selenium in notable quantities but the output is at present restricted to a narrow market, chiefly in Great Britain; at present the whole production is marketed. Further research as to new uses is in progress so that a wider market may be created for this relatively new commercial product, particularly if increases in production are associated with a lowering of the market price.

The chief use at present is in the glass and pottery industries, both as a colouring agent, as in ruby glass, and to neutralize objectionable oxides; the most important development is probably the photo-electric cell or electric eye which is finding many industrial applications; selenium cells also play an important part in television; it is being used in alloying stainless steel for screw and bolt stock, developing improved cutting and threading qualities; a large potential market, at present inactive, exists in certain rubber-compounding industries, and it is being now used for vulcanizing and fireproofing switchboard cables and to increase the resistance of rubber to abrasion, these applications still being subjects of research; it finds an application in the manufacturing of certain kinds of paints; selenium oxychloride is a powerful solvent of many substances. Selenium is also used for the manufacture of certain dyes, and there are numerous other minor uses. Its application to the production of improved cutting-tool steels and to the vulcanizing of rubber seems to offer the best opportunities for the expansion of the market.

A nominal price for selenium, black powdered, 99·5 per cent pure, of $2 per pound at New York has prevailed for several years.

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FEBRUARY, 1936. (A.W.G.W.)

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16. SILVER IN 1935

Ores Mined and Producing Localities

In Nova Scotia, a very small quantity of silver is derived from the gold-quartz ores. The production in Quebec is mainly obtained from the treatment of the gold and the gold-copper ores of the Rouyn and adjoining areas in western Quebec. In Ontario, the production is mostly from the silver-cobalt-nickel-arsenical ores of Cobalt, Gowganda, and South Lorrain; from the gold ores of Porcupine, Kirkland Lake, Patricia district, and a few other less important areas, and from the treatment of the nickel-copper ores of the Sudbury district. In Manitoba, silver is derived from the copper-zinc ores of the Flin Flon and Sherritt-Gordon mines in northern Manitoba, and from the gold-silver ores of eastern Manitoba. British Columbia is the leading silver-producing province in the Dominion; in this latter province the silver is obtained mainly from the treatment of silver-lead-zinc ore from the Sullivan mine in the East Kootenay district. Important contributions are also made from the mines on Wallace mountain, near Beaverdell; from the silver-gold-bearing pyrites of the Premier mine, near Stewart; from the gold-silver ores of the Pioneer and Bralorne mines, Bridge River, and from the low-grade copper ore of Britannia mine, near Vancouver, and of the Granby Company's mines (now idle) near Anyox. The Yukon production is derived from the argentiferous lead ore of the Mayo district.

Important Developments and Prospective Producing Localities

Development work at the Noranda copper-gold mine in western Quebec during the last few years has increased considerably the known ore reserve. The ores mined at Noranda in 1934 had the following approximate silver content: siliceous gold ore 0·13 ounce a ton; concentrating sulphide ore 0·32 ounce a ton; and direct smelting sulphide ore 0·43 ounce a ton. The Quebec production amounted to 668,821 ounces as against 470,254 ounces in 1934.

The silver mines of Cobalt and adjoining areas in Ontario have in recent years been showing a gradual falling-off in production accentuated by the unprecedented low price of silver. The improvement in the price of silver in 1934 and in 1935 stimulated production for a short time particularly by lessees who are operating several of the old former producing properties. The increased production of the Sudbury nickel-copper mines added noticeably to the Ontario silver production. The Ontario production was 5,159,307 ounces as against 5,321,160 ounces in 1934.

The copper-zinc ores of Flin Flon and Sherritt-Gordon mines in northern Manitoba contain small quantities of gold and silver which are recovered at Montreal East, Que., in the refining of the blister copper. The Flin Flon property situated on the boundary line of Manitoba and Saskatchewan, was operated at full capacity throughout the year. The 900-ton concentrator of the Sherritt-Gordon remained idle in 1935. A small quantity of silver is also obtained from the treatment of gold ores in eastern Manitoba. The Manitoba-Saskatchewan silver production in 1935 amounted to 1,426,901 ounces, as against 1,340,471 ounces in 1934.

In British Columbia the Sullivan silver-lead-zinc mine and the Premier gold-silver mine were, by far, the principal producers, but contribution was made by the Beaverdell silver camp, by the Base Metal (Monarch) silver-lead-zinc mine, by the Pioneer gold mine, and by various smaller mines in West Kootenay. The British Columbia production was 9,167,751 ounces as against 8,729,721 ounces in 1934, and 11,825,930 ounces in 1930.

The curtailment of operations at the copper mines of British Columbia during the past few years has contributed substantially to the decline in Canadian production, which has been only partly made up by increased output from the Sullivan mine.

In the Yukon, production in 1935, mainly from the Mayo district high-grade silver-lead ore, amounted to 54,752 ounces, as against 515,542 ounces in 1934 and 2,227,476 ounces in 1933. Unless new discoveries are made and the improvement in the price of silver is more permanent, a further decline in production is probable.

In the Northwest Territories important discoveries of silver-bearing ores made during the last few years in the vicinity of Echo bay, and along Camsell river, Great Bear Lake district, have been followed by more intensive exploration and development. The Eldorado 75-ton concentrator started operation early in December, 1933, and is equipped to produce pitchblende as well as silver concentrate and is also making important recovery of native silver; the output was greatly in excess of that for 1934. The Bear Exploration and Radium, Ltd. (B.E.A.R.) installed a 25-ton concentrator in 1935, but made no shipments. Consolidated Mining and Smelting Company proceeded with further development work at greater depth, but did not ship any ore in 1935. The White Eagle property was closed down and the plant removed. El Bonanza did further underground exploration work, opened up a rich shoot of native silver and made a shipment of 4 tons of picked samples to Trail.

Production and Trade

The total Canadian production of silver in 1935 was 16,624,426 fine ounces, valued at $10,770,950; in 1934 the production was 16,415,282 ounces, valued at $7,790,840.

The exports were 1,364,008 ounces of silver in ore and concentrate valued at $882,106 and 16,963,181 ounces of silver bullion valued at $10,953,083; in addition silver coins to the value of $934,208 were exported.

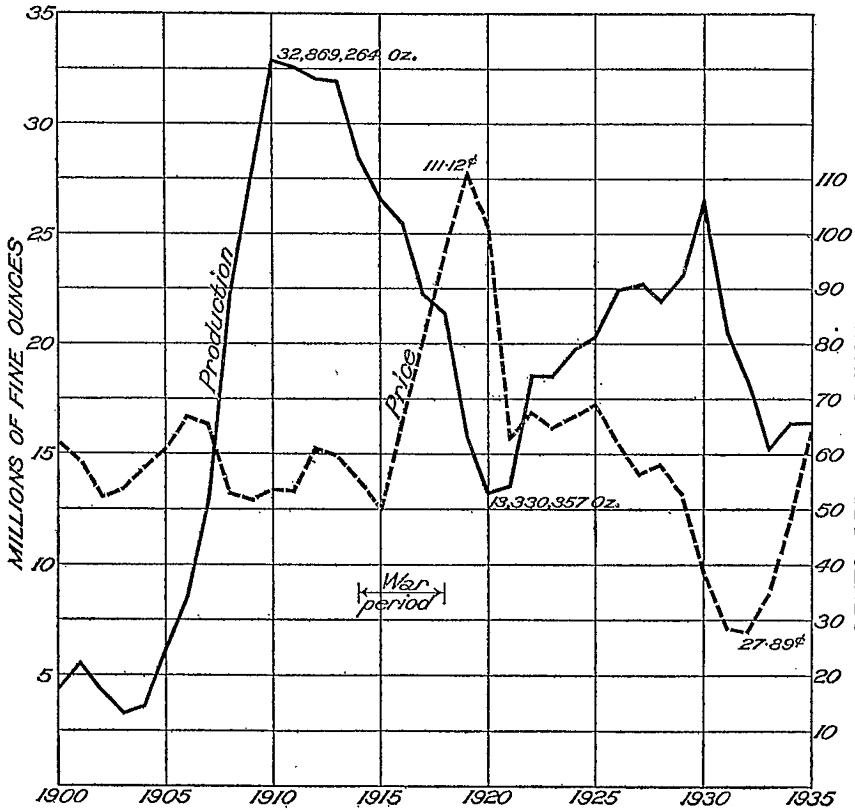
The imports included unmanufactured bullion to the value of $5,584,906 and manufactures of silver to the value of $164,795.

The world's production of silver, as estimated by the Engineering and Mining Journal, was 207,348,000 ounces against 185,388,000 ounces in 1934, 169,413,000 ounces in 1933, and 262,241,000 ounces in 1929.

The price of silver in New York in 1935 averaged 64·273 cents a fine ounce, as against 47·973 cents in 1934. From a monthly average of 54·418 cents for January the price gradually improved to a maximum of 74·356 cents for May, then declined gradually to 58·420 cents for December.

The Canadian Commodity Exchange Inc. was formed in Montreal in 1934 to provide a market for spot and future contracts in silver, and trading started in the latter part of October, 1934.

Ratification of the London Agreement of July, 1933, regarding silver was made in March, 1934, by the Canadian Government, and Canada has agreed to purchase or otherwise withdraw from the market 1,671,802 fine ounces of silver (current mine production) each year beginning with the calendar year 1934, the agreement terminating on January 1, 1938, or when the Government of India shall have disposed of 175,000,000 fine ounces,



Silver production and price trends in Canada, calendar years 1900-1935.

and is conditional on similar undertakings being entered into by Australia, the United States, Mexico, and Peru, covering an aggregate of 35,000,000 fine ounces annually. The Bank of Canada, acting for the Government of Canada, purchased the stipulated amount in 1935.

By executive order, dated December 30, 1933, President Roosevelt has provided for the purchase by the United States Treasury until December 31, 1937, of domestic silver mined subsequent to the date of the order to the extent of at least 24,421,410 ounces annually, on the statutory basis of $1.29 an ounce, but 50 per cent of each lot of metal will be retained by the Mint, as seigniorage and to cover service charges so that the seller will receive 64½ cents an ounce for his metal. The Silver Purchase Act of 1934, which became law in June, 1934, authorized an increase to 25 per cent in the proportion of silver to gold in the monetary stocks of the United States and the President's Proclamation and Executive Order of August 9, 1934, nationalized all silver bullion then in the United States.

On December 10, 1935, the United States Treasury withdrew from the London market, but afterwards the Treasury denied any fundamental change of policy.

It is impossible to foresee the future trend of the market because it is virtually in a state of liquidation and the question is how quickly the surplus silver will be absorbed and at what price. China has been forced off the silver standard and its future policy is yet uncertain.

ISSUED BY THE MINES BRANCH,
DEPARTMENT OF MINES, OTTAWA,
FEBRUARY, 1936. (A.B.)

17. TELLURIUM IN 1935

Producing Localities

Tellurium has been found native and is also an essential constituent of several minerals, but none of these minerals has been found in quantities large enough to constitute commercial ore. Tellurium-bearing minerals also occur in minute quantities in association with other metallic ores, and the element may be recovered as a by-product in the refining of copper or lead, and also when sulphuric acid is manufactured from certain classes of pyrites. The potential possibilities of the recovery and production of tellurium are great, but the small present-day demand offers only a small market, so that the quantity of refined metal produced is small. Tellurium can be recovered from residues of lead and copper refineries; such ores occur in British Columbia, Manitoba, Ontario, and Quebec.

Important Developments

At the present time two electrolytic copper refineries are operating in Canada, both of which have recently installed plants for the recovery of tellurium from their refinery sludges, and for the production of refined metal; one of these refineries began production in March (1934) and the other in the following November; both have been in production during 1935. The blister copper from which this metal is obtained is that produced by the International Nickel Company at Copper Cliff, Ontario, and by the Flin Flon mine in Manitoba, and by Noranda Mines at Noranda, Quebec. There is no recovery in Canada from sulphuric acid chamber sludges.

Production and Trade

The production in 1935 was 14,375 pounds valued at $65,550 as against 5,130 pounds valued at $25,599 in 1934; most of the output was marketed in the United Kingdom and a small amount was sold locally.

Metallic tellurium, until quite recently, was of very minor industrial importance; formerly it was used to a very limited extent in some radio work; it finds limited applications as a colouring agent in the ceramic industry; was used in the photographic art and also for blackening art silverware; in a hydrocarbon compound, diethyl telluride, it found some use as an anti-knock compound in gasolines. More recently industrial research has shown that when alloyed with lead the tensile strength and toughness of the lead is increased greatly; the use of small quantities of tellurium as a substitute for tin in the lead used for sheathing electric wire cables is reported to improve their resistance to both heat and corrosion; it has also been used for improving the machining qualities of certain steels. Very finely powdered tellurium may be used as a rubber-compounding material; it is stated that its presence shortens the time of curing, and greatly improves the resisting qualities of the product. These two recently developed uses have increased the commercial demand for the metal.

A nominal price for tellurium of $2 per pound at New York has prevailed throughout the year.

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FEBRUARY, 1936. (A.W.G.W.)

18. ZINC IN 1935

Ores Mined and Producing Localities

Nearly three-quarters of the zinc produced in Canada comes from the Sullivan silver-lead-zinc mine near Kimberley, British Columbia. The balance of the production is being obtained from the Flin Flon copper-zinc mine at Flinflon, Manitoba, the Base Metals (old Monarch) silver-lead-zinc mine near Field, British Columbia, the Britannia copper mine on Howe sound, British Columbia, from several small properties in West Kootenay district and from the Tetreault lead-zinc property near Notre-Dame-des-Anges, Portneuf county, Quebec.

Important Developments and Prospective Producing Localities

In British Columbia, the Sullivan mine and the 6,000-ton a day concentrator at Kimberley of the Consolidated Mining and Smelting Company were operated at full capacity throughout the year. The Trail zinc plant of this company had its capacity increased in recent years by various additions and improvements to a total of 400 tons of slab zinc a day, or 145,000 tons a year. The Monarch mine, near Field, owned by the Base Metals Mining Corporation suspended milling operations on December 14, and an extensive exploration campaign is now under way.

Several relatively small lead-zinc properties in the West Kootenay district, which had been lying idle for the last few years, resumed operations during 1935; the principal amongst these are the Mammoth near Silverton, the Noble Five and the Rambler near Sandon, and the Whitewater near Kaslo.

In Manitoba, development work at the Flin Flon mine of the Hudson Bay Mining and Smelting Company added considerably to the known ore reserves and the 5,000-ton concentrator and the zinc refinery were operated at full capacity, producing at the annual rate of about 25,000 tons of slab zinc. The Sherritt-Gordon copper-zinc mine, situated about 50 miles northeast of Flinflon has been idle since May, 1932.

In Ontario, the Treadwell-Yukon Company, Limited, for several years carried on extensive development at the Errington mine, in the Sudbury basin, but this property remains idle.

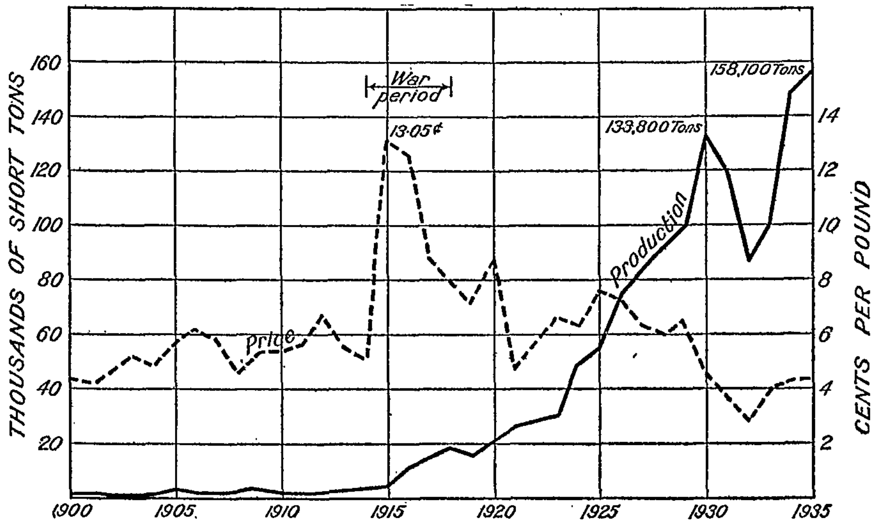
In Quebec, the Amulet concentrator was in operation for a few months in 1930, and has since been idle. The Waite-Amulet mine remains idle, awaiting more favourable market conditions. The Normetal (Abana) was re-opened in 1934 and extensive development carried on, resulting in further increasing the known reserves of copper-zinc ore. Following completion of the development program, work was suspended in February, 1935.

In Nova Scotia the Stirling mill, completed in 1930, operated only a few months, and has remained idle since that time. Preparations are now under way for putting the mine into production.

Production and Trade

The Canadian production of metallic zinc in 1935 was 320,558,659 pounds valued at $9,934,081; the previous year's production was 298,579,683 pounds valued at $9,087,571.

The imports of zinc products of all kinds, including oxide and chemicals, were valued at $1,730,889, as against $1,506,221 in the previous year; the exports, chiefly in the form of spelter, were valued at $8,211,142, as against $7,694,013 in 1934.



Zinc production and price trends in Canada, calendar years 1900-1935.

The world's production of zinc in 1935 is estimated at 1,461,000 tons, as against 1,301,595 tons in 1934, and 1,626,898 tons in 1929.

Canada in 1934 became third largest producer of slab zinc, displacing Poland, and is now contributing about 11 per cent of the world's total. The two largest producers of slab zinc are the United States and Belgium.

The principal producing countries, according to the origin of the ore, are as follows: United States, Canada, Australia, Germany, Mexico, and Poland.

The average price of zinc at Montreal for 1935 was 3·99 cents per pound as against 4·06 cents in 1934. The St. Louis price was 4·328 cents as against 4·158 cents in 1934.

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FEBRUARY, 1936. (A.B.)

19. ARSENIOUS OXIDE IN 1935

Producing Localities

Refined white arsenic (As_2O_3) and arsenical insecticides are made in Canada by one company only—the Deloro Smelting and Refining Company, Ltd., of Deloro, Ontario—which obtains all its raw material from the silver-cobalt-arsenic mines of northern Ontario.

In the fall of 1935, O'Brien Gold Mines, Ltd. put in operation a baghouse to extract arsenic from the fume of a small roasting plant used in the treatment for the recovery of gold of an arsenical concentrate made on its gold mine in Cadillac township, Quebec; but no information is at hand as to the disposal of the crude white arsenic so obtained. Possibly some of it may find a market in the Prairie Provinces as grasshopper poison.

The Beattie gold mine in Quebec, and the Bralorne gold mine in British Columbia, both ship arsenical gold concentrate to the Tacoma smelter in the United States, but no payment is made for the contained arsenic.

Prospective Producing Localities

Deposits containing arsenopyrite associated with more or less gold, other than those mentioned above, are known to occur and are in some cases being worked for gold in the provinces of Ontario, Quebec, British Columbia, and Nova Scotia. These, in the aggregate, could no doubt supply considerable amounts of concentrate suitable for the production of arsenic were it profitable to do so.

Production and Trade

Production of arsenious oxide in Canada in 1935 was 2,558,789 pounds valued at $75,326; as compared with 1,647,513 pounds valued at $56,412 in 1934.

Exports of arsenic were 2,230,600 pounds valued at $69,866, as against 1,291,900 pounds valued at $45,012 in 1934.

Imports of arsenious oxide were 11,759 pounds valued at $546 in 1935, and 1,637,382 pounds valued at $41,688 in 1934.

Imports of other compounds of arsenic in 1935 were valued at $38,236.

Though world consumption of white arsenic has fluctuated considerably during the last ten years the quoted price has remained consistently at four cents or less a pound; and when consideration is given to the fact that most of it is obtained as a by-product of metal recovery, through necessity rather than choice, and that the potential supply from this source is far in excess of any probable demand there seems little likelihood of any sustained increase in price. For instance, it is estimated that 40,000 tons of white arsenic, roughly equivalent to the world's total consumption, is extracted annually from roaster gases at the Boliden mine, in Sweden, alone. Only a very small fraction of this amount is refined for sale and appears in production returns. The remainder, in the form of crude arsenic, was at first mixed with cement, cast into blocks, and sunk in the sea; but this method of disposal proving too expensive it has, since early in 1931, been placed in huge storehouses built for the purpose, in the hope that through research a use for it may ultimately be found.

The chief uses of arsenic are in insecticides, weed killers, sheep and cattle dip, wood preservatives, and in the manufacture of glass; minor uses are in pigments, tannery supplies, and pharmaceutical preparations.

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FEBRUARY, 1936. (A.H.A.R.)

20. ASBESTOS IN 1935

Producing Localities

Canadian asbestos, which is of the chrysotile or serpentine variety, is all obtained from the Eastern Townships, Quebec. Fibrous minerals similar in structure to asbestos but whose fibres lack the fineness and elasticity of chrysotile have been reported from other localities in Canada; the qualities and quantities of the material so far discovered are such that no commercial developments have followed; such materials are occasionally used for making mineral fillers.

Important Developments and Prospective Producing Localities

No new asbestos properties were reported as opening during the year. Explorations and developments on the properties of the operating companies have disclosed reserves of ore sufficient for many years to come. The recent application of block-caving methods in the King mine of the Asbestos Corporation has resulted in remarkable reductions in mining costs, in improved mill feed, and in improved working conditions.

Production and Trade

The production in 1935 is reported to have been 210,467 tons valued at $7,054,614; this may be contrasted with the production of 155,980 tons in 1934 valued at $4,936,326. In 1929 the production was 286,324 tons.

Most of the Canadian chrysotile asbestos fibre is exported; in 1935 the recorded exports were 100,186 tons of asbestos valued at $5,300,176; 100,025 tons of asbestos sand and waste valued at $1,585,481; and manufactures of asbestos valued at $175,452.

The only imports recorded are 60 tons of asbestos packing valued at $56,208; brake and clutch linings valued at $235,620; other products not specifically designated, valued at $420,469.

Apparently the end of the long decline in production was reached about the middle of the year 1933, since a decided improvement in business was noted during the last quarter of that year. This improvement has continued throughout the last two years. Most of the production was exported to the United States, and there was also a small improvement in the amount of business done with European importers.

According to the monthly reports of the Dominion Bureau of Statistics the prices for Crude No. 1 fibre were maintained at $500 per ton throughout the year; the demand for this grade of fibre exceeded the supply. Crude No. 2 prices ranged from $200 to $225 a ton; spinning fibres from $90 to $135; magnesia and compressed sheet fibre, $90 to $100; on other grades the prices throughout the year were fairly constant, ranging from a minimum of $11 a ton for shorts to a maximum of $75 a ton for high-grade shingle-stock.

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FEBRUARY, 1936. (A.W.G.W.)

21. BITUMINOUS SAND IN 1935

Producing Localities

Deposits of bituminous sand occur along Athabaska river between the 23rd and 26th base lines, in the northern part of the province of Alberta; exposures may be seen along both sides of the Athabaska river and its tributaries. Small shipments of bituminous sand have been made from the following locations: Sec. 32, Tp. 88, R. 8; Sec. 14, Tp. 89, R. 9; Sec. 8, Tp. 89, R. 9; Sec. 24, Tp. 95, R. 11; and Sec. 1, Tp. 97, R. 11. Between the years 1927 and 1930 about 2,000 tons had been shipped for laboratory investigations and about 3,000 tons for the construction of demonstration pavements and road surfaces.

Important Developments

While there are no important developments to record, three firms are continuing efforts to develop commercial operations. Available markets are restricted because as yet no refining facilities are available. Consequently the bitumen produced does not meet standard specifications.

The Department of Mines has conducted a comprehensive investigation of these deposits of natural asphalt. In addition to field exploration during fifteen field seasons, extensive laboratory studies of the bituminous sand and of bitumen separated from it have been made. Various industrial applications for the separated bitumen, as for example, in the manufacture of paints and varnishes and in the manufacture of certain rubber goods, are also being investigated. Results obtained have directed attention to the extent and potential economic importance of the deposits. Representatives of private capital have recently completed further studies with a view to commercial development. Products which may be derived include motor fuels and other liquid hydrocarbons as well as certain solid and semi-solid bitumens.

Production and Trade

During 1934 one firm produced approximately 15,000 gallons of separated bitumen valued at $2,475; this represents the mining and treatment of about 825 tons of bituminous sand. Another firm mined and shipped 38 tons of bituminous sand for experimental studies. Pending the installation of refining equipment there was no production of separated bitumen during 1935. Forty tons of bituminous sand was shipped for paving purposes.

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DEPARTMENT OF MINES, OTTAWA,
FEBRUARY, 1936. (S.C.E.)

22. CEMENT IN 1935

Materials Used and Producing Localities

The chief raw materials used in the manufacture of cement are limestone and clay. The chief product is Portland cement, for the production of which there are 12 operating plants having an aggregate rated annual capacity of about 14,000,000 barrels. The large excess of capacity over production is due to the fact that plants were built to take care of an anticipated demand which has not materialized. In the east the plants are operated throughout the year at a percentage of rated capacity, while in the west the plants are operated to capacity only part of the year. If business justified such a course all plants could operate throughout the year because most plants are now equipped with stock houses sufficient to take care of the natural contraction of sales during the winter season.

During 1935 the Canada Cement Company operated the following plants: Hull and Montreal East, in Quebec; Port Colborne, in Ontario; Fort Whyte, in Manitoba; and Exshaw, in Alberta. Other operators were the St. Mary's Cement Company, at St. Mary's, Ontario; the British Columbia Cement Company at Bamberton, B.C., and the Coast Cement Company at Vancouver, B.C.

Production and Trade

The average selling prices of cement per barrel in the several producing provinces, f.o.b. plant, were as follows:—

	1932	1933	1934	1935
Quebec	$1 43	$1 40	$1 42	$1 41
Ontario	1 43	1 45	1 41	1 41
Manitoba	2 27	2 28	2 10	2 27
Alberta	2 06	2 01	1 99	1 99
British Columbia	2 12	1 95	1 90	1 87

The Canadian production of Portland cement in 1935 was 3,648,086 barrels valued at $5,580,043; in the previous year the production was 3,783,226 barrels valued at $5,667,946.

Exports were 55,607 barrels valued at $44,365, as against 70,046 barrels valued at $55,181 in the previous year.

The imports of Portland cement and hydraulic lime were 17,738 barrels valued at $60,079, in addition certain unspecified cement products valued at $17,102 were imported.

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DEPARTMENT OF MINES, OTTAWA,
FEBRUARY, 1936. (A.B.)

23. CHROMITE IN 1935

Ores Mined and Producing Localities

Practically all the chromite heretofore mined in Canada came from the Coleraine area in the Eastern Townships, Quebec; but since 1923 the only production from this source has been a few small shipments of negligible importance.

In 1935, the Chromium Mining and Smelting Corporation shipped some hundreds of tons of chromite gathered from surface outcrops on its property at Obonga Lake, in northwestern Ontario, to its electric smelting plant at Sault Ste. Marie for the production of ferrochrome.

Important Developments and Prospective Producing Localities

In May, 1935, Chromium Mining and Smelting Corporation, Ltd., purchased the electric smelting plant of Superior Alloys, Ltd., at Sault Ste. Marie, Ontario, and, after making some alterations and repairs began producing ferrosilicon in June and ferrochrome in August. Chromium ore from the company's deposits at Obonga Lake is brought by tractor over a winter road 26 miles long to Collins station on the Canadian National railway, thence shipped by rail to the smelting plant at Sault Ste. Marie, where it is smelted to ferrochrome containing from 15 to 80 per cent chromium according to customer's demands. Early in 1936 it was announced that the smelting plant was to be enlarged and a 100-ton concentrator built at the mine. The company's products are marketed in Great Britain and the United States.

Some five or six years ago considerable work of an investigatory nature was done on chromite deposits in British Columbia, but there have been no reports of recent activity in connexion with these.

Production and Trade

Production of chromite in Canada in 1935 was valued at $14,947, as against a value of $1,578 in 1934.

Imports of chromium ore into Canada are not separately recorded. In 1935 imports of chromium products included: 2,634,271 pounds of sodium bichromate valued at $148,421; 151,336 pounds of potassium bichromate valued at $12,150; chrome firebrick to the value of $46,882; nickel-chromium bars and rods, containing more than 10 per cent chromium, 43,434 pounds valued at $41,381; and chromium metal and tungsten metal and scrap alloys of these two metals, 36,007 pounds valued at $22,454.

The growing use of chromium alloy steels and other types of corrosion- and abrasion-resistant alloys has been the chief cause of the increased demand for chromite in recent years. Other important uses are for refractory materials and for metal for electro-plating.

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DEPARTMENT OF MINES, OTTAWA,
FEBRUARY, 1936. (A.H.A.R.)

24. DIATOMITE IN 1935

Producing Localities

The International Diatomite Industries, Limited, head office 60 East 42nd St., New York City, continuously operated the deposits at New Annan, south of Tatamagouche, in northeastern Nova Scotia, where the material is calcined and pulverized. Several car lots were shipped to Toronto by the Canadian Multi-Cell, Ltd., Martin Siding, Muskoka, Ontario. Fairey & Cunliffe shipped a car lot from the stock of the B.C. Refractories, Ltd. deposit at Quesnel, British Columbia.

Important Developments and Prospective Producing Localities

The bulk of the output was maintained, as in former years, by the International Diatomite Industries, Ltd., Tatamagouche, Nova Scotia. The decrease in production below that of 1934 was due to price cutting for use in battery boxes by United States competition, for which purpose the bulk of the Nova Scotia diatomite was formerly employed. The Company's New Annan calcination plant operated most of the year. The diatomite was extracted principally from Rhude pond and some from Lockerby pond, both located a few miles south of New Annan. The calcined diatomite is treated in a small mill at Tatamagouche station, 12 miles to the north. No material was extracted from the Digby Neck deposit, but a drainage system of the bog was carried out. About 20 per cent of the output was sold in Canada, mainly as a sugar filter-aid, a carefully prepared product which had never before successfully competed with the imported filter-aids. Other outlets for the Nova Scotia diatomite were as filler in various trades, insulation purposes, and as a metal polish base.

Continued prospecting in southern New Brunswick by Mr. W. M. Campbell, of West St. John, New Brunswick, revealed more diatomite ponds, some of which contain muds capable of producing high quality calcined diatomite.

In the Muskoka region of Ontario, several companies were active during the year. The Diatomite Products, Ltd. leased its properties and plant (erected in 1933) to the Canadian Multi-Cell, Ltd., who made several additions to its treatment plant, situated close to the railway at Martin's Siding. A certain amount of air-dried mud in storage was treated and a few car lots of diatomite were produced and shipped. Early in the year the mill of the Diatomite Refiners Company, Toronto (late Dominion Diatomite Co.) near Novar was burnt down but was later rebuilt and a few tons of diatomite were treated in the new plant. The Muskoka Diatomite, Ltd., Toronto, erected a treatment plant on its property south of Gravenhurst and production is expected as soon as the mill is completed. A drainage system of the swamp was carried out during the year.

The B.C. Refractories deposit at Quesnel, B.C., taken over by Fairey & Cunliffe, Vancouver, was not operated but a few tons of diatomite was sold from stock. Prospecting was continued by Mr. W. H. Hind of the Western Non-Metallics, Ltd., on the Burnaby Lake deposit situated close to Vancouver city. A small amount of the diatomite mud was put through the experimental plant erected in Vancouver.

Production and Trade

The Canadian production in 1935 was 843 tons valued at $34,540; in the previous year the production was 1,372 tons valued at $54,910. There are no export records available, but from private information it is known that about 70 per cent of the production was exported mainly to the United States, and some to Great Britain; sales within Canada amounted to almost 300 tons against 135 tons in 1934 and constitutes a record. The imports in 1935 were approximately 2,550 tons, almost all from California, U.S.A., against 2,500 tons in 1934.

More Canadian diatomite was used in the home industries during the year and the demand as a filter-aid, both for sugar and for use in cleaning establishments, increased. Approximately 90 per cent of the diatomite now being consumed in Canada is in the form of filter-aids, while about 8 per cent is used for insulation purposes and the remainder is absorbed as a filler, concrete admixture, silver polish base, and in chemicals. A few companies in the vicinity of Toronto are manufacturing diatomite insulation bricks and stove pads, the former mainly using up, however, the diatomite imported or purchased in 1933. Although actual production of Canadian-made diatomite bricks still remains small, there has been an appreciable amount of experimental work carried out by some companies resulting in efficient products. The tendency is, however, towards insulation-refractory bricks replacing the two separate types as a combined brick.

Owing to a price war in the United States there has been a considerable reduction in the price of all grades. The long pending patent suit between the Johns-Manville (Celite) Company and the Dicalite Company, both of California and by far the largest producers, has recently been decided by the lower courts in favour of the latter company, so that indications are that prices may go lower and will be reflected in Canada. General improvement in business throughout the country, especially in the building and allied industries, should cause an increased demand, particularly for concrete admixture and insulation material.

Deposits containing medium quality diatomite are very common in some parts of Canada. Owing, however, to foreign competition and to the, at present, comparatively small Canadian demand, only the properly prepared diatomite of the highest quality can now be successfully marketed on a scale sufficiently large to warrant the operation of a property and the erection of a plant.

The present price in Canada varies from $35 to $40 per ton for concrete admixture; $35 to $75 for insulation and filtration; up to $200 in small lots for material suitable for polishes; imported insulation bricks vary from $85 to $140 per 1,000 according to grade and density.

In the United States there were, during the year, about 17 producers, almost all of which showed an increase, indicating a general increase over 1934, the total sales for the year being estimated at 110,000 short tons.

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DEPARTMENT OF MINES, OTTAWA,
FEBRUARY, 1936. (V.L.E.-W.)

25. FELDSPAR IN 1935

Producing Localities

Canada produces feldspar mostly of high-potash type, averaging around 13 to 14 per cent K_2O. Spar of high soda content is relatively uncommon, and very few deposits of this grade have been worked. The largest production of soda spar has come from an occurrence in Aylwin township, Quebec, where previous to 1931, the material was worked for use in scouring-soap compounds. In 1935, several hundred tons of soda spar were shipped from a property in Sabine township, Bancroft district, Ontario.

Although the bulk of the production of feldspar has always come from a few larger mines, a number of small scattered producers formerly contributed to the total. There has been a notable decrease in the number of small operators in recent years, and the industry has tended to become concentrated in the hands of a few larger producing concerns, which either conduct their own operations or have mining done for them under contract.

For some years past, production in eastern Canada has been about equally divided between Ontario and Quebec provinces. Most of the Quebec mines are situated in the Buckingham district, Papineau county, which has long been one of the main productive areas. This district also furnishes all the dental feldspar produced. The Ontario production in 1935 came principally from the Perth district, Lanark county, where the Bathurst mine, the present largest Canadian operator, furnished about one-third of the year's total production. The Hybla district, Hastings county, once an important centre of production, now furnishes only a small output and in 1935 only one mine was in active operation. A small tonnage was also produced in 1935 from mines in McKay and Lyndoch townships, in Renfrew county. Twelve mines contributed to the eastern total, six in Ontario and six in Quebec. For the second successive year, Manitoba registered a production of several thousand tons of ceramic grade feldspar; the material is mined in the Pointe du Bois district, on the Winnipeg river, in the southeastern part of the province, and is shipped to a grinding mill at Warroad, in Minnesota.

Important Developments and Prospective Producing Localities

A development during the year that may extend the Canadian feldspar market, was the erection by Canadian Nepheline, Ltd. of a plant at Lakefield, Peterborough county, Ontario, for the treatment of nepheline syenite rock, extensive bodies of which occur in the nearby township of Methuen. The rock consists of a mixture of albite (soda feldspar), microcline (potash feldspar), and nepheline (a silicate of soda, potash, and alumina), and has been shown to possess valuable ceramic properties. The presence of about 2 per cent of impurities, mainly black mica and magnetite, renders it necessary to remove these minerals by a magnetic separation process. The plant is planned for an initial capacity of 20 tons per day, and is equipped with crusher, rolls, screens, and a Dings magnetic separator. The product made will be of 20-mesh, intended for the glass trade. Nothing further has developed in connexion with the occurrences of similar rock in the Bancroft district, Hastings county, Ontario, from which an experimental shipment was recorded in last year's review.

Increasing use is being made of magnetic separation for removing small but objectionable amounts of mineral impurities, such as mica, tourmaline, garnet, magnetite, etc., from crushed feldspar before grinding. Progress is also recorded in the use of flotation for the same purpose. Singly, or in combination, these processes may ultimately come to be employed in the treatment of the large tonnages of impure feldspar rock contained in the waste dumps of every spar mine.

Production and Trade

Production of feldspar in 1935 totalled 18,477 tons valued at $149,588, as compared with 18,302 tons valued at $147,281 in 1934, a slight increase in quantity and value. Imports of ground spar were 608 tons valued at $10,995, compared with 917 tons valued at $14,255 in 1934. Imports of crude feldspar were 1 cwt. valued at $5 in 1935, and 2,443 cwt. valued at $990 in 1934. Exports were 9,959 tons valued at $59,893, as against 10,532 tons valued at $65,158 in 1934. With the exception of a small tonnage of dental spar, the entire import and export trade is with the United States.

Prices remained around the 1934 level, ranging from $6 to $7 per ton for the best ceramic grade to $4 for No. 2 quality, all f.o.b. rail. The large bulk of the exports from eastern mines is consigned to grinding plants at Rochester, N.Y.; as previously stated, the Manitoba production all goes to a mill at Warroad, Minnesota. Ground spar continued to be quoted at $16 per ton, ex mill.

Both domestic grinding mills, that of Frontenac Floor and Wall Tile Company, at Kingston, Ont., and that of Canadian Flint and Spar Company, at Buckingham, Que., operated throughout the year, as did also the grinding unit of the Bon Ami Company at Montreal.

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DEPARTMENT OF MINES, OTTAWA,
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26. GRANITE IN 1935

(Building, Monumental, and Crushed)

Producing Localities

The stone quarried in this industry consists of granite and other related crystalline igneous rocks used for building, decorative, monumental or constructional purposes. Producing properties are situated in a number of localities in the provinces of Nova Scotia, New Brunswick, Quebec, Ontario, Manitoba, and British Columbia.

Important Developments and Prospective Producing Localities

A large proportion of the granite produced in Canada is used for foundations for highways, for permanent ballasting of railway road beds, for heavy aggregate in large concrete structures, for filling breakwaters and for bridge piers. Owing to heavy curtailment of operations of this nature during the last few years the production of granite for these purposes has been seriously affected. The improvement shown in these branches of the industry during the past two years leads one to believe that, while production is still far below the record years, the recovery may be steady.

The production of granite in Nova Scotia during the year 1935 remained about the same as the previous year, however, a new development took place during the month of December when W. F. Dauphinée, who operates a granite dressing shed at Shelburne, Nova Scotia, took over the property of the Queensport Granite Company, later known as the Lawdon Granite Company at Queensport, Guysborough county.

The crude blocks of granite from this quarry are being shipped to Halifax where they are being dressed for facing the lower portion of the new Provincial Government annex building.

The province of Quebec furnishes the largest proportion of granite for building purposes, the Stanstead, Scotstown, and St. Sébastien districts being the biggest producers of this class of stone. The low ebb of building construction during the past few years has seriously affected this part of the industry with the result that a number of the smaller producers were forced to close down, and while public building programs inaugurated during the past two years have materially assisted this industry, such properties will remain closed until such time as further improvement in business warrants their operation.

Further work was done on the quarry of grey granite in Manitoba, 100 miles directly east of Winnipeg on the Winnipeg-Kenora highway. Stone from this quarry was supplied for the Government office building on Main St., Winnipeg.

A number of contracts for public and semi-public buildings were supplied with granite from Canadian firms, such as the Roman Catholic Church at Valleyfield and the Government office building in Winnipeg, and these contracts were of material assistance to the industry.

Granite for monumental purposes is produced in the Maritime Provinces as well as in Quebec, Ontario, Manitoba, and British Columbia, and this material finds a small but steady market. At the same time there is still an appreciable amount of foreign stone, principally black, being imported for this use, and a quarry of similar material in Canada would find a ready market for its product. There are deposits of "black granite" at several localities in the Maritime Provinces, Quebec, and Ontario which give promise of yielding stone of good quality, but until such time as these are further developed their definite value is unknown.

With the large extent of country in Canada underlain by granite, the prospects of finding deposits of stone suitable for the several uses are decidedly promising.

Granite is employed for building construction mainly in the larger buildings such as public and semi-public structures and institutions. Last year saw an increase in such contracts and this increase was reflected in the granite industry by a decided increase in the production of the higher priced dimensioned stone.

Production and Trade

The Canadian production of granite for 1935 was 252,473 tons valued at $1,091,447; in the previous year the production was 200,285 tons valued at $781,739. Our exports were 1,255 tons valued at $10,301 (granite and marble unwrought), as against 1,153 tons valued at $9,766 in the previous year. The imports of granite were valued at $99,136 in 1935, compared with imports valued at $98,134 in 1934.

Small amounts of granite were imported during the year from the United States and Europe for monumental purposes, but prospecting for similar stone in Canada is active and it is possible that in time this importation will be replaced by Canadian material. Like many other products, the demand for a certain class of stone for monumental purposes varies, so that one type of stone which may have a steady market for a number of years will in time be completely superseded by an altogether different type. At the present time the so-called black granite and the greys seem to be in most demand for monuments, with a consequent falling-off in the requests for other colours.

In the building trade, although still very quiet during the year, the tendency has been to employ the coloured granites to a greater extent than heretofore in the form of thin polished slabs for trim for buildings in which the main colour scheme needs some contrasting colour to relieve it.

The upward turn in the building industry is reflected by an improvement in the granite industry, and the coming year should, therefore, show a continued improvement in the use of dimensioned stone as large construction projects develop.

Canadian granites are suitable for all the purposes for which granite is used, and with consistent advertising to enable the Canadian products to become better and more widely known, there is no reason why this industry should not have a promising future.

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DEPARTMENT OF MINES, OTTAWA,
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27. GRAPHITE IN 1935

Producing Localities

Graphite mining in Canada has been at a low ebb for a number of years past, with only one active producer in the field. Formerly, plants were operated in the Perth and Bancroft districts in Ontario, and in the Buckingham, Guenette, and St. Rémi districts in Quebec, but all of these mines and mills have been forced to close down by the competition in the world market of more cheaply produced foreign graphite.

For a number of years past the only active operator has been the Black Donald Graphite Company, near Calabogie, in Renfrew county, Ontario. This concern works a deposit of exceptionally high-grade graphite, unsuitable for crucibles but well adapted for lubricants and foundry purposes.

Important Developments and Prospective Producing Localities

The Black Donald Graphite Company installed a new modern mill a few years ago and operated fairly steadily during 1935, producing various grades of refined graphite as well as facings, etc., for the foundry trade. Shipments in 1935 totalled 1,761 tons. Black Donald graphite is now being satisfactorily used in pencils, the higher-grade concentrate being reduced to extremely fine powder in a new type of pulverizer, making a product comparable in fineness to the amorphous graphite hitherto preferred for pencil purposes.

Production and Trade

The value of the 1935 production was reported as $78,500, compared with $71,424 in 1934. About 10 per cent of the reported 1934 quantity (1,518 tons) and value represented sales of old stocks of flake graphite made by a Quebec mill out of operation for a number of years past. Exports were 3,548 tons valued at $145,772 compared with 1,935 tons valued at $90,129 in 1934. Total graphite imports, including crucibles, were valued at $137,477: the value of such imports in 1934 was $143,004. No graphite crucibles are manufactured in Canada.

Conditions in the world graphite industry showed little change over preceding years. As far as the American continent is concerned, Madagascar and Ceylon continue to dominate the field in the supply of flake graphite and plumbago respectively, for the crucible trade, and of lower-grade graphite dusts for foundry work. Mexico and Korea supply much of the amorphous graphite used in pencils, dry batteries, and commutator brushes. Artificial graphite, made in the electric furnace, also enters largely into dry battery work and into liquid lubricants and electrodes.

Large reserves of natural flake graphite exist on the American continent, but it has proved economically impossible to produce refined graphite from them at prices that will permit competition with the Madagascar article. In addition, a trade preference exists in favour of Madagascar graphite for crucibles, on account of superior physical character—size, weight, and thickness of the flake commensurate with equal carbon content.

Intensive competition between Ceylon and Madagascar producers in world markets has been a disturbing factor in recent years, resulting in severe dislocation of prices and consequent distress to operators in both countries. The condition of affairs culminated in the formation in 1935 of a syndicate of Madagascar graphite producers, and government recommendation that a similar association be formed in Ceylon, the object of these bodies to be to consider ways and means of avoiding the economic crisis confronting the graphite industry in both countries.

Inquiry is sometimes directed to the Mines Branch regarding possible markets for amorphous graphite, deposits of which exist in the Maritime Provinces and in other parts of Canada. On account of its finely-divided character, natural low-grade amorphous graphite usually cannot be satisfactorily freed from admixed impurities and must be employed in the natural state. Such amorphous graphites, with 35 to 45 per cent carbon content, are employed chiefly for structural paints; they are available in quantity, command only a relatively low price, and accordingly cannot stand heavy transportation charges, being usually mined at or near the point of manufacture.

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28. GRINDSTONES, PULPSTONES, AND SCYTHESTONES IN 1935

Producing Localities

Grindstones. The Read Stone Company, Sackville, N.B., the only producer of these stones, sold approximately the same quantity as in 1934. The majority of these stones came from the vicinity of Stonehaven in the Bay of Chaleur, N.B., and a few from Quarry Island, Pictou county, N.S.

Pulpstones. The J. A. and C. H. McDonald Co., Vancouver, decreased their pulpstone sales about 50 per cent. The stone is being obtained from a new quarry on the northwest end of Gabriola island, near Nanaimo, Vancouver island, B.C.

Scythestones. The output of these stones, which are quarried by the Read Stone Co., Stonehaven, and by G. A. Smith, Shediac, N.B., increased slightly over 1934.

Important Developments and Prospective Producing Localities

There are no important new developments.

Production and Trade

Canadian grindstones are quoted at $44 per ton, and pulpstones at $57 per ton.

The production of all grades of stones in 1935 was 708 tons valued at $34,010; in the previous year the production was 987 tons valued at $46,478. The exports of these stones in 1935 were valued at $184 as against a valuation of $4,947 in the previous year. The imports, which consisted chiefly of pulpstones, were valued at $144,223, as against $144,818 in the previous year.

The large size Canadian grindstones are mainly used for sharpening pulp-mill and tobacco knives, and in the United States are used in the file, machine-knife, granite tool, and shear manufacturing industries. The small stones are used for scythe and axe grinding. Substantial competition from the artificial grinding wheel and to some extent from foreign natural stones was felt.

There is a demand for good pulpstones, particularly for use in the large magazine grinders, but as deposits containing thick beds of the proper quality sandstone are very scarce in Canada, only about 1 per cent of the stones used in Canadian pulp mills is being produced in the Dominion. The Gabriola stones supplied the British Columbia mills and the New Brunswick stones were used in mills in Nova Scotia, New Brunswick, and Quebec.

The artificial pulpstones made of silicon carbide segments and also more recently of fused alumina segments are gradually but surely replacing the natural stone. Approximately 225 of these manufactured stones are now in use in Canadian and Newfoundland mills.

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FEBRUARY, 1936. (V.L.E-W.)

29. GYPSUM IN 1935

Producing Localities

The materials produced are the hydrous calcium sulphate, commonly known as gypsum, the partly dehydrated material known as plaster of Paris or wall plaster, and the anhydrous calcium sulphate known as anhydrite. Gypsum is marketed in the crude lump form, ground as " land plaster " and " terra alba," or ground and calcined as plaster of Paris and wall plaster. An increasing proportion of the calcined material each year enters into the manufacture of wall-board, gypsum blocks, insulating material, acoustic plaster, etc. Anhydrite is used mainly as a fertilizer for the peanut crop in the South Atlantic states.

Nova Scotia is the largest producer of gypsum in Canada followed by New Brunswick, Ontario, Manitoba, and British Columbia.

Important Developments and Prospective Producing Localities

The several large companies operating in Canada still carried on under reduced normal production, maintaining, however, their endeavours to reduce operating costs and improve their products, so that, while their sales during the year are still below those of normal years, a decided improvement was shown over 1934.

In Nova Scotia, work was started during the year on re-opening the McAskill property, two miles east of Little Narrows on the south side of St. Patrick channel, Victoria county, Cape Breton island. This property was operated a number of years ago, but has recently been acquired by New York interests under the name of the Victoria Gypsum Company. The intention is to ship crude rock to the United States.

The Atlantic Gypsum Products Corporation, Ltd., of Boston, Massachusetts, U.S.A., with quarries at Walton, Cheticamp, and Aspy Bay, Nova Scotia, started boatload shipments of crude gypsum from their Cheticamp property to London, England, in June, 1934. This marked the first commercial shipment of Canadian gypsum to the British Isles, and since that date regular shipments have been made during the shipping seasons, the tonnage handled in 1935 being practically double that shipped in the previous year.

Extensive deposits are known in northern Ontario and these deposits form a potential reserve, which in years to come may be called upon to supply material to the northern parts of Ontario and Quebec.

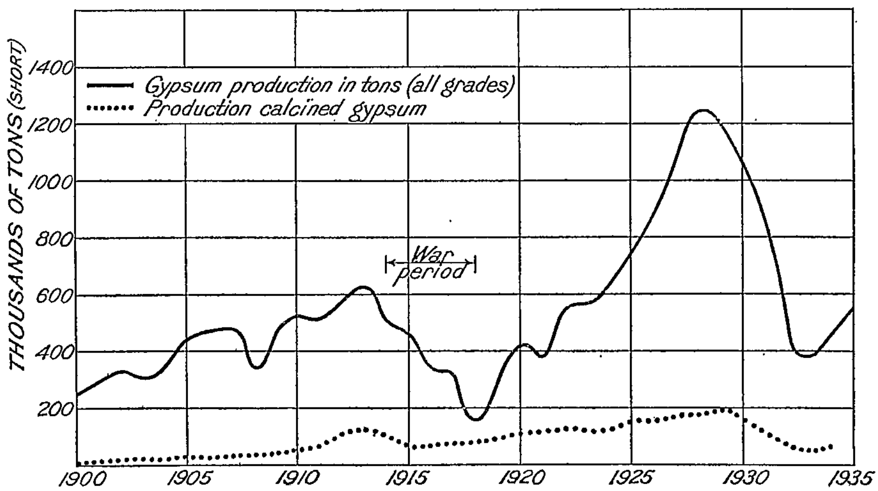
The deposits in northern Alberta, although situated at a distance from markets and railway transportation, are of good grade. There are also several known deposits in British Columbia, in addition to those already being worked, which may be operated when conditions warrant their exploitation.

The use of anhydrite in England for the manufacture of sulphuric acid, ammonium sulphate, and special plasters is rapidly increasing. Canada is fortunate in having extensive deposits of this material favourably situated for commercial exploitation, the material from which has been proven by tests carried out by the Department of Mines to be of excellent grade for the above purposes. At the present time the small production of anhydrite in Canada is exported principally as a fertilizer for the peanut crop, but it is quite probable that when conditions are more favourable Canadian anhydrite may be used for the manufacture of special plasters, similar to the material now being marketed in England. Extensive research work is now being carried on in the United States with a view to determining whether anhydrite cannot be partially if not wholly substituted for gypsum as a retarder in cement.

Production and Trade

The production of gypsum in 1935 totalled 541,864 tons valued at $932,203; in 1934 it was 461,237 tons valued at $863,776. The exports amounted to 440,058 tons valued at $546,412, compared with 355,690 tons valued at $430,039 in 1934. The imports were 2,006 tons valued at $35,718, while in the previous year they amounted to 742 tons valued at $21,148.

The general upward trend of business in Canada during 1935 was not nearly so marked in the building industry, an industry which usually lags from six months to a year behind any general improvements of business



Gypsum production in Canada, calendar years 1900-1935.

conditions. The gypsum industry, which is entirely dependent on the building industry, has, in consequence, not shown so rapid a rate of increase as some of the other industries, nevertheless the improvement in the past two years has been definite and steady each year and gives promise of rapid improvement in the years to come.

The fact that a large percentage of the Canadian production is shipped in the crude form to the United States has a great influence on the Canadian gypsum industry, since the amount shipped is entirely dependent on the status of the building industry of the United States.

This fact is well illustrated by the accompanying chart. The production curve of gypsum in Canada shows a comparatively steady increase until 1907 when the depression started in the United States with a consequent falling-off of gypsum shipments. Increased production is again manifest up to the war years, but it is interesting to note that the greatest depression in the curve does not take place until the United States entered the war in 1917. From 1919, with the exception of a slight falling-off in 1921, until 1929, the rise is rapid, when an all-time peak production was recorded. With the start of the depression in the last months of 1929, the fall in production of gypsum in Canada was rapid and it is only in the last two years that the upward swing has again commenced. Probably the production curve for calcined gypsum gives a truer picture of the gypsum industry in Canada, since this represents the greater part of the total production that is consumed in the country. This rises steadily until the war years when the drop was rapid, reaching its lowest point in 1915 just after the war started, and remained almost stationary for several years. The rise from 1919 to 1929 was gradual but steady, but fell off again gradually after the latter year as the results of the depression became more manifest. The upward trend for the last two years is small but definite.

The use of gypsum products in the building trades has made rapid progress in past years because of its lightness, durability, fire-resisting, insulating, and acoustic properties; and tiles, wall-boards, blocks, and special insulating and acoustic plasters have been developed. As the gypsum industry is so closely dependent on the construction activity in the country, the increase of 27·4 per cent and 64·7 per cent in the value of building contracts awarded in Canada during the year as compared with 1934 and 1933 was reflected in the increased production of gypsum. With the larger proportion of the crude gypsum quarried in Canada being shipped to the United States for the manufacture of gypsum products, industrial conditions in that country also have an important bearing on the industry.

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DEPARTMENT OF MINES, OTTAWA,
FEBRUARY, 1936. (L.H.C.)

30. IRON OXIDES (MINERAL PIGMENTS) IN 1935

Ores Mined and Producing Localities

Ochreous iron oxide, sold uncalcined and used chiefly in the purification of illuminating gas, constitutes the major production of the ores classed under this title. The calcined form of ochreous iron oxide is also produced for use in the manufacture of paints; a smaller proportion of natural iron oxides associated with clay-like materials in the form of umbers and siennas is also produced in both the raw and calcined state, for use as pigments in paint manufacture.

The major part of the production has, for many years, come from the vicinity of Three Rivers, Quebec, at Red Mill and Pointe du Lac. In recent years a deposit has been opened near Les Forges, Quebec. The deposit near Ste. Anne de Beaupré, Quebec, was exhausted in 1930 and the plant was removed to the deposit at Les Forges.

A small production of iron oxide from British Columbia has been reported since 1923 and is used chiefly for gas purification.

Important Developments and Prospective Producing Localities

There were no important developments during 1935. The industry is a comparatively small one, and the quantity produced varies but little from year to year. The present producing localities have been able to meet the requirements of the domestic pigment trade for the cheaper grades for many years past. Should the demand increase, there are other prospective deposits which could be drawn upon; two of these are located in Saguenay county, Quebec, in the townships of Iberville and Bergeronnes respectively, and were investigated and sampled in 1929-1930 by the Quebec Bureau of Mines. A deposit in Lynch township, Quebec, has been a producer in the past.

There are numerous occurrences of ochres and iron oxides in Quebec and Ontario, and some of these might be utilized, should the market demand warrant their development.

In Nova Scotia there are various beds of ochres and umbers which have been worked in the past to a small extent. In Alberta and British Columbia are several known deposits of ochre, some of which have commercial possibilities, but owing to their present inaccessibility and also to the limited market they have had little development. In northern Manitoba, large deposits of ochre have been reported from the vicinity of Grand Rapids and Cedar Lake, but these also, owing to similar reasons, have not been developed. In Saskatchewan there are several known deposits of ochres and iron oxides, but which as yet have not been developed commercially.

Production and Trade

The records of Canadian production of ochres include in a single item all grades of material from the low priced raw material to the high priced calcined products; in 1935 sales of ochreous iron oxide in Canada totalled 5,396 tons valued at $76,745, as compared with 4,959 tons valued at $66,166 in the previous year. The production during the past ten years has averaged practically 6,000 tons per year. Our exports of mineral pigments are stated to have been 1,925 tons valued at $108,032 in 1935, as against 1,618 tons valued at $96,131 in 1934. Imports of all kinds of ochres, siennas, and umbers totalled 1,555 tons and were valued at $54,661 in 1935; in the previous year the total combined weights amounted to 1,028 tons valued at $39,380. In addition there were imported prepared oxides, fillers, and related products, some of which were probably not ochres, valued at $623,698 as against a valuation of $753,827 in 1934.

The demand within the country for these products is fair. Most of the higher grade oxides, ochres, and umbers used in the paint trade are imported from Europe, and, even in the case of some of the cheaper grades, European oxides compete with the domestic products owing to the fact that the former do not require calcining to produce the desired colour.

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FEBRUARY, 1936. (E.H.W.)

31. KAOLIN (CHINA CLAY) AND BALL CLAY IN 1935

Producing and Prospective Producing Localities

The only place where china clay has been produced commercially in Canada is near St. Remi d'Amherst. A group of open pits and mines was operated for several years, but these workings were closed in 1923 and have not been re-opened since. A nearby property is now being worked from which both china clay and silica are produced. The china clay, an air-separated product, is used mainly by the paper trade.

Deposits of high-grade, white-burning clays occur on Mattagami, Abitibi, and Missinaibi rivers in northern Ontario. Some of these clays may be classed as ball clays and others as china clays. Recent developments at two points in this area will probably result in a small production of clay in the near future. (*See* Geological Survey Summary Report, 1926, Part C, p. 16; article by W. S. Dyer, Canadian Mining and Metallurgical Bulletin, April, 1928; Annual Report, Ontario Department of Mines, Vol. XXXVIII, Part IV, 1929; and Vol. XXXIX, Part IV, 1930.)

A deposit of white-burning clay occurs on Punk island, Lake Winnipeg, Manitoba. (*See* Mines Branch Report No. 690, p. 25.)

Ball clays of high bond strength occur in extensive deposits in southern Saskatchewan, about 60 miles south of Moose Jaw. Shipments have been made from the vicinity of Readlyn and Willows to potteries in Ontario and the United States. (*See* Mines Branch Report No. 468; Geological Survey Summary Report, 1930, Part B, p. 31; American Ceramic Society Journal, 1929, p. 360.)

Near Williams lake, British Columbia, is a deposit referred to in the report of the Minister of Mines of British Columbia, 1926, as consisting of "silicate of alumina." This material, if not a true kaolin, is similar to it. Some trial shipments made to Vancouver were used as a fireclay.

Production and Trade

The production of china clay in 1935 was 170 tons valued at $1,520 as against 48 tons valued at $504 in 1934.

The exports in 1935, chiefly ball clays, are reported to have been 5,591 cwt., valued at $2,595; in the previous year the exports were 7,619 cwt., valued at $1,668. The imports of china clay were 708,890 cwt. valued at $287,997; in the previous year the imports were 654,999 cwt. valued at $250,705.

There is a large steady demand for various grades of china clay in Canada, for use in the manufacture of paper and rubber as well as in the ceramic industry.

Ball clays are used in the ceramic industry as a bonding clay in the manufacture of porcelain and similar compounded bodies. While the market in Canada is not large, it is growing and there are also good prospects of developing a profitable export market in the United States.

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FEBRUARY, 1936. (H.F.)

32. LIME IN 1935

Products and Producing Localities

Lime is marketed as quicklime and in the hydrated state, the latter product being a specially prepared slaked lime in the form of a very fine powder and sold in 50-pound, multi-walled paper bags. Quicklime comprises about 80 per cent of the total sales and is marketed in lump form, pebble form, crushed, and pulverized. In the lump and pebble forms, quicklime is sold either in bulk or packed in barrels. Crushed quicklime (1 inch and under) and pulverized quicklime (ground to minus 20 mesh, and in some plants to minus 50 mesh) are sold in multi-walled paper bags which have been made airtight by the incorporation of one ply of either cellophane or of asphalt-treated paper.

Lime is manufactured in every province except Prince Edward Island, though production in Saskatchewan is intermittent and on a very small scale. Fifty-six plants were in operation during 1935. Both high-calcium and dolomitic limes are produced in Nova Scotia, New Brunswick, Ontario, and Manitoba, but only high-calcium lime is made in Quebec, Alberta, and British Columbia. Ontario produces more than half of the total output, and Quebec about a third.

Important Developments and Prospective Producing Localities

Three small lime plants making quicklime only, have recently come into production in western Canada, viz., at Poplarfield, Manitoba; Cadomin, Alberta; and Vavenby, British Columbia.

The placing of pulverized quicklime on the market by a number of Canadian lime companies is a development worthy of note. This product finds a market in the chemical and metallurgical industries and it also competes with hydrated lime for plastering purposes on account of the fact that on being slaked it yields a highly plastic putty that does not require more ageing than does putty made from hydrated lime. Sales have increased rapidly, particularly in western Canada where highly plastic hydrated lime is not cheaply available. Producers report that pulverized lime packed in airtight bags will keep for 4 to 6 months without air-slaking, as against 2 to 3 weeks for lump lime.

During 1935 Dominion Lime Co., Lime Ridge, Que., began the manufacture of "waterproof" lime, which is a pulverized quicklime to which certain waterproofing ingredients have been added.

Localities where lime may be produced in the future are numerous because of the abundance of suitable limestone in most parts of Canada.

Production and Trade

Conditions, generally, in the lime industry are much improved over those of 1934 as there has been a steady increase in demand for lime for building construction as well as for chemical and metallurgical purposes. The establishment of new lime-using industries and the increased industrial activity in general augurs well for future production. On the Pacific coast, however, the prolonged longshoremen's strike and the closing down of the Granby smelter, which was a large consumer of lime, resulted in a decreased production in that region over that of 1934.

The Canadian lime production in 1935 consisted of 342,853 tons of quicklime valued at $2,423,922, and 63,372 tons of hydrated lime valued at $508,260, which represents an increase over the 1934 production of 308,122 tons of quicklime valued at $2,238,256 and 59,991 tons of hydrated lime valued at $507,541. Exports of lime amounted to 5,230 tons valued at $50,296, a decrease of 5,445 tons over the exports of 1934. Imports, which are all from the United States, increased to 1,708 tons valued at $21,671 from 571 tons valued at $10,821 in 1934, according to data supplied by the United States Bureau of Mines.

The price of lime fluctuated somewhat in 1935, as compared with that in 1934, being down in some localities and up in others, though in no case was there a large difference. Prices per ton f.o.b. the principal plants were as follows: hydrated finishing lime, $12.50 to $18; masons' and chemical hydrate, $6 to $16; quicklime, $6 to $9.60. The wide range in price is due in large part to differences in the quality of the product and to the geographical location of the plants.

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DEPARTMENT OF MINES, OTTAWA,
FEBRUARY, 1936. (M.F.G.)

33. LIMESTONE (GENERAL) IN 1935

Products and Producing Localities

Limestone is marketed in a wide variety of forms ranging from large squared blocks of dimension stone for use in construction, down to extremely fine dust used chiefly as a mineral filler. The largest proportion of the output, however, is marketed in the crushed and screened condition for use as road metal, concrete aggregate, railroad ballast, and as flux in metallurgical plants. Large quantities are also marketed in the crude or broken state for use in chemical and metallurgical industries.

Limestone is produced in all the provinces except Prince Edward Island and Saskatchewan, with the major portion of the production being in Ontario and Quebec.

Important Developments and Prospective Producing Localities

The rock wool industry, which was established in Canada in 1934 following the publication by the Mines Branch of the results of investigations which showed that large deposits of argillaceous dolomite in Ontario were suitable for the manufacture of this commodity, is developing rapidly. There are now two rock wool plants in Ontario, and one in Quebec that at present is making slag wool.

In 1935, Canada Crushed Stone Corporation, Ltd., of Hamilton, opened a new quarry about 2 miles northwest of the former quarry at Dundas, Ont., and quarrying has been discontinued at the latter property. The new quarry is operated entirely by electrical equipment and the stone is transported by a high-speed electric haulage system to the crushing plant at Dundas.

A new quarry for the production of crushed stone was opened at Amherstburg by Industrial Construction Co., Ltd.

F. J. Beale is shipping high-calcium limestone from a newly opened quarry at Vananda, Texada Island, B.C., the products being crude limestone for use in pulp mills, and also crushed and ground limestone for various uses.

In anticipation of an increased demand for limestone in the immediate future several new quarry companies were incorporated during the past year and intend to commence production in 1936.

New uses are continually being developed for limestone, particularly for ground or pulverized material. Soft, pure limestone ground to a specified degree is being used for cleaning soft-metal moulds by a process similar to sand-blasting. Pulverized high-calcium limestone, occasionally with iodine added, is being rather extensively used as an ingredient of poultry and stock foods. The forcing of a thick slurry made of limestone screenings and water beneath sunken portions of pavement has proved a satisfactory method of raising the pavement to grade. Increasing quantities of ground dolomite are now being used for agricultural purposes following the realization that magnesia as well as lime is required for the proper growth of many crops.

Production and Trade

The 1935 production of limestone for general use, exclusive of that used for building stone, lime, and cement, is estimated at 3,500,000 tons valued at $2,700,000, compared with a production of 3,720,250 tons valued at $2,933,614 in 1934. Exports of limestone are not separately recorded, but comparatively small quantities, chiefly for use in sugar refineries and for agricultural purposes, were exported to the United States. Imports are not separately recorded, but large tonnages for use as blast furnace flux are imported from the United States and Newfoundland, and lesser quantities for use in pulp mills in northern Ontario are also imported from the United States. These importations are due not to any lack of suitable limestone in Canada, but to the fact that the foreign limestone can be obtained more cheaply because of its more favourable location with respect to certain centres of consumption.

Limestones of great variety of chemical composition and physical characteristics are available in Canada and are being extensively quarried for the numerous purposes for which limestone is used. The current production of limestone for all purposes constitutes over 94 per cent of the total Canadian stone production.

ISSUED BY THE MINES BRANCH,
DEPARTMENT OF MINES, OTTAWA,
FEBRUARY, 1936. (M.F.G.)

34. LIMESTONE (STRUCTURAL) IN 1935

Products and Producing Localities

The principal quarries from which limestone for building purposes is obtained are in the following localities: St. Marc des Carrières, Quebec (3 quarries producing grey limestone); Montreal (2 large and several small quarries producing grey limestone); Queenston, Ontario (1 quarry producing silver-grey limestone together with small quantities of buff and of variegated grey-and-buff); Longford, Ontario (1 quarry producing both buff and silver-grey limestone); Tyndall, Manitoba (3 quarries producing mottled grey, mottled buff, and mottled variegated limestone). Other quarries producing small quantities of building stone for local use are worked near Quebec City and Hull in the province of Quebec; at Ottawa, Kingston, and Wiarton, in Ontario; and at Banff, Alberta.

The products of some of the quarry companies consist of stone in all stages of manufacture from the mill block to elaborately carved material for the ornamentation of both interiors and exteriors of buildings. Other companies sell stone only in the mill block, the cutting and carving being done in plants of various cut-stone contractors in different parts of the country. Waste material is utilized for crushed stone, rubble, riprap, flagging, chemical and metallurgical use, and for lime manufacture. The tonnage and value of waste products are not included in the production data given below.

Important Developments and Prospective Producing Localities

The year 1935 saw a greatly increased production of limestone for building purposes over that of the previous year. All companies regularly engaged in this business were in production and a number of quarries, in eastern Canada particularly, were worked at capacity throughout the quarry season.

Lake St. John Quarry Co., Ltd., operating at Longford, Ont., opened a new quarry a short distance from the original quarry on the lake shore.

Production and Trade

Production of limestone for building purposes during 1935 is estimated at 40,000 tons valued at $500,000, compared with a production of 27,529 tons valued at $224,218 in 1934. Only the value of dimension stone marketed either in mill blocks or in the finished state by the quarry companies is included in the above data; the value of the work done on the stone by cut-stone contractors not being included. Exports of limestone for building purposes are very small and are not separately recorded. Imports of all varieties of building stone, excepting marble and granite, during 1935, were valued at $24,549, as compared with imports having a value of $19,749 in 1934.

Prices of limestone in the mill block f.o.b. quarry have remained almost constant during recent years, and range from 50 cents to $1 per cubic foot, depending on size of block and grade of stone.

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DEPARTMENT OF MINES, OTTAWA,
FEBRUARY, 1936. (M.F.G.)

35. MAGNESITE IN 1935

Products and Producing Localities

No magnesite, within the strict meaning of the term, is being produced in Canada at the present time, but magnesitic dolomite composed of an intimate mixture of magnesite and dolomite, which when properly processed is proving more suitable than magnesite for many purposes, is quarried and processed at Kilmar and Harrington East, in Argenteuil county, Quebec. It is marketed in the caustic and in the dead-burned states; in the form of bricks; as finely ground refractory cement; and also in combination with chrome as an ingredient in certain other types of refractories.

Magnesia products made in Canada from imported magnesite include fused magnesia (artificial periclase), optical periclase, and "85 per cent magnesia" pipe-covering.

Brucite (hydrated magnesium oxide) occurs in limited quantity as an alteration product of serpentine in the asbestos-producing districts in the Eastern Townships of Quebec, and small quantities are obtained in connexion with the quarrying of asbestos.

Important Developments and Prospective Producing Localities

Continued progress is being made in the development of new refractory products from the magnesitic dolomite deposits in Quebec. One of the newest developments is the production of chemically bonded unburned bricks and shapes, which are proving satisfactory for the lining of rotary kilns and metallurgical furnaces. A number of new cements and refractory basic plastics have also been developed and uses have been extended for many of the other products being made from magnesitic dolomite.

Deposits of earthy hydromagnesite occur in British Columbia near Atlin and Clinton, and large deposits of siliceous magnesite occur between Cranbrook and Kimberley. These latter deposits have been acquired by Consolidated Mining and Smelting Company and some development work has been done but there has been no production to date.

The deposits of magnesitic dolomite in Argenteuil county, Quebec, are ample to supply magnesia products for domestic requirements for many years and also to support a large export trade. No other deposits of magnesitic dolomite or of magnesite of commercial grade are known in the eastern part of North America, and consequently the Quebec deposits are favourably situated to supply the large markets for magnesia products in eastern Canada and the eastern United States.

Certain magnesium products such as magnesium metal and technical carbonate are currently being made not from magnesite but from other sources of magnesium—metallic magnesium being made from magnesium chloride brine, and technical carbonate being made from dolomite. In California, sea bittern is now being utilized as well as magnesite for the production of magnesia.

Production and Trade

During 1935, magnesitic dolomite products to the value of $628,558 were made by Canadian companies, as compared with a production valued at $382,927 in 1934. Exports amounted to 1,577 tons valued at $43,338, as compared with 1,997 tons valued at $56,670 in 1934. Imports of magnesite products consisting of magnesia pipe-covering, caustic and dead-burned magnesite, magnesite brick, and crude and ground magnesite had a value of $464,316, as compared with imports valued at $469,198 in 1934.

Recent trends in the making of magnesia products have been toward making of products which combine a high degree of refractoriness with ability to resist shock and to carry load at a high temperature, and also toward the further development of chemically bonded unburned brick and shapes for lining metallurgical furnaces and cement kilns. Caustic-calcined magnesia is used for fettling the bottoms of basic open-hearth furnaces, and for the construction of floors and floor tiles.

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FEBRUARY, 1936. (M.F.G.)

36. MARBLE IN 1935

Products and Producing Localities

Marble is produced in the form of squared blocks for sawing into slabs and monuments, and in the crude or broken state for making terrazzo, stucco dash, whiting substitute, marble flour, artificial stone, and building rubble. Waste from some quarries producing block marble is sold for chemical and metallurgical purposes.

Marble quarries are operated in Quebec, Ontario, Manitoba, and British Columbia.

The largest marble quarry in Canada is at Phillipsburg, Que., and is operated by Wallace Sandstone Quarries, Ltd.; this quarry yields 4 varieties of clouded grey marble, some of which are lined and tinted with pale green. Black marble is also produced from another quarry nearby. The company operates a large mill for the sawing and polishing of its products. The Trenton limestone quarried for building stone at St. Marc des Carrières, Que., takes a good polish and yields a dark brownish grey marble; a portion of the output of these quarries is thus utilized. White dolomitic marble is quarried and crushed by White Grit Co. at Portage du Fort, Pontiac county, Que., and by Canada Marble & Lime Co., L'Annonciation, Labelle county, Que., for the making of terrazzo, stucco dash, poultry grit, artificial stone, and other products.

In Ontario, black marble is quarried at St. Albert, near Ottawa, by Silvertone Black Marble Quarries. At Longford, near Orillia, the Lake St. John Quarry Co., Ltd. is producing buff marble and silver-grey marble; this stone is also used for building purposes and has been used with satisfaction for sculpturing. At Bancroft, Haliburton county, a number of handsome marbles are available, the most striking of which, known as Bancroft Laurentian, is a clouded-grey breccia in which the bond is of a rich chocolate colour. The Bancroft quarries were operated during 1935 by Rock Construction Company, Ltd., Toronto, and 3 varieties of marble—Bancroft Laurentian, Imperial Green, and Buff—were quarried. White marble is quarried at Marmora by the Bonter Marble & Calcium Co., Ltd., and at Haliburton by Bolender Bros. for the making of terrazzo, poultry grit, stucco dash, and artificial stone. Shipments of deep red limestone for making terrazzo were made from the Vader property near Bancroft.

In Manitoba, green serpentine, mottled gold-and-buff, mottled purplish red and rose marbles are available, but the only production during 1935 consisted of a small quantity of buff and red marble from the quarry of Winnitoba Marble Co. at Fisher Branch, 100 miles north of Winnipeg. This was used for building rubble and for making terrazzo.

In British Columbia, the Canadian Marble and Granite Works, Ltd. of Edmonton operates a quarry in bluish grey marble at La Blanche station on the Lardeau branch of the Canadian Pacific railway. The marble blocks are shipped to the company's plant at Edmonton for the making of monuments.

Important Developments and Prospective Producing Localities

The recent increase in demand for marble, consequent upon increased activity in building construction, has stimulated interest in a number of undeveloped deposits. Trial shipments of blocks to firms in Toronto have recently been made from a deposit of banded blue marble 12 miles west of Lavant, Lanark county, Ont., and from a deposit of white marble at Kaladar, Lennox and Addington county, Ont. Other deposits of white and of green marble near Perth have been core drilled.

Continued efforts are being made to find new ways of utilizing marble. In the United States thin slabs of semi-translucent, light-coloured marble have been used in place of glass in large windows of buildings such as railway stations to obtain a soft diffused light free from the glare of direct sunlight. The property of marble to diffuse transmitted light is also being taken advantage of in new lighting arrangements wherein coloured lights are placed behind thin slabs of specially treated marble, giving unique effects in which the veining of the marble is shown to advantage. White marble dust with white cement is being used for the making of permanent traffic markings on roads and streets.

Considerable interest was aroused during the summer of 1935 by the reported discovery of large deposits of travertine near Calgary. Further investigation, however, disclosed that the deposits were not large and consisted mostly of soft and friable calcareous tufa.

There are many deposits of beautifully coloured marbles in Canada, particularly in Ontario, Quebec, and British Columbia, that have never been fully investigated. The chief reason why many of these deposits are not being worked is that the present demand in Canada for marble of any one colour, other than for a staple variety such as white, is comparatively small. The demand too for marble of certain colour changes from time to time; at present there is little call for red and blue marbles, but buff and black marbles are in vogue.

Production and Trade

The production of marble during 1935 amounted to 10,951 tons valued at $72,049, compared with the production of 13,783 tons valued at $69,475 in 1934. Exports of marble are recorded with exports of granite and the exports of the two during 1935 amounted to 1,255 tons valued at $10,301, as compared with exports of 1,153 tons valued at $9,766 in 1934. Imports of marble during 1935 had a value of $39,497, against a value of $37,984 in 1934. Current imports of marble are mostly in the form of unpolished slabs and in the form of sawn stock for tombstones—the finishing being done in marble mills throughout Canada. Ordinarily a considerable quantity of block marble is also imported, but the comparatively small current imports of marble in this form is to be explained by the fact that there are still large stocks of imported marble blocks on hand from 1929-30. Most of the imports of marble blocks are from the United States, France, Belgium, and Great Britain, though practically all of that coming from Great Britain originates in various European countries. Italy has been a large exporter of marble to Canada but at present none is being imported owing to the sanctions imposed by the League of Nations. Within the past two years imports of black marble have practically ceased as the

Canadian market is now being supplied from domestic quarries, principally from the recently opened black marble quarry at St. Albert.

The Canadian market calls for interior decorative marble almost exclusively, and there is very little used for exterior building purposes. A considerable quantity is, however, used for making tombstones. In recent years there has been an increasing demand for marble in the form of terrazzo instead of slabs or tiles for flooring, and this has led to many inquiries being addressed to the Mines Branch for information as to where marbles of various colours could be obtained.

Prices of marble depend on the quality and rareness of colouring but they are governed largely by the prices of well known foreign marbles, many of which enjoy a world-wide market. The market for Canadian marbles is almost wholly domestic and production therefore depends almost entirely on the volume of building construction in the Dominion.

ISSUED BY THE MINES BRANCH,
DEPARTMENT OF MINES, OTTAWA,
FEBRUARY, 1936. (M.F.G.)

37. MICA IN 1935

Producing Localities

The Canadian mica production is confined almost exclusively to the phlogopite variety termed in the trade " amber mica." Deposits of muscovite, or " white mica " are known, but attempts to mine this type have usually not proved profitable, and the production has been negligible.

The productive mica region lies for the most part within a radius of about one hundred miles from the city of Ottawa, the northern portion of the field lying principally between or adjacent to the Gatineau and Lièvre rivers, in Quebec, and the southern portion in the Perth-Kingston district, in Ontario. In marked contrast to earlier years, when the production was drawn from a large number of mines, including many small and intermittently-worked properties, most of the output at the present time is derived from a few larger and old-established operators.

Important Developments and Prospective Producing Localities

Nothing new from the producing angle developed during the year. The improved demand for Canadian mica, due, it is believed, in part to curtailment of supplies from Madagascar and also to a largely increased demand for heat-resistant amber mica, led to the re-opening of a few smaller mines, and there was also a small production from newly-opened deposits in Templeton and Joliette townships, Que.

An examination was made during the year of an unusual occurrence of fine, flake mica of muscovite or sericite type at Baker Inlet, on the British Columbia coast, about 40 miles south of Prince Rupert. The deposit lies about 300 feet above tidewater and is well situated for development. It is in the form of a flat-lying bed, from 3 to 7 feet thick as exposed in the mountain side, and consists essentially of a soft mass of friable mica that can be readily rubbed to a fine powder between the fingers. There are few visible impurities present and the mica is soft and highly lustrous. In view of the ease with which the material can be pulverized, and of the exceptional shipping facilities, the deposit merits consideration as a source of flake mica for the roofing, rubber, and paint trades. The high lustre of the mica might also render it acceptable to the wallpaper trade. The property is controlled by Philip M. Ray, of Prince Rupert, B.C., who has opened up a few small prospect pits, but no shipments have yet been made.

Production and Trade

The following figures show the production of the five leading mica products in 1934 and 1935:—

	1935		1934	
	Pounds	Value	Pounds	Value
Knife trimmed..	111,459	$52,959	61,003	$25,628
Thumb trimmed.	12,013	3,616	90,726	27,360
Splittings..	32,921	15,506	75,050	33,120
Rough cobbed..	30,605	2,448	2,459	514
Scrap..	1,068,616	7,509	1,766,031	10,449

Sheet mica is marketed in various classes, depending on the amount of preparation the mine-run material receives. Formerly, much of the output was sold in the semi-rough form, termed "thumbed-trimmed," but this practice has now been largely supplanted by knife-trimming, which provides a much higher-grade of product. Scrap mica, representing the waste from mining or trimming operations, is sold to grinding mills for the production of mica powder, used extensively in the roofing and rubber trades. Most of the scrap so sold is consigned to mills in the United States: a large proportion of it represents small-sized sheets recovered by screening of the waste-dump rock at old mines.

The improved market for Canadian sheet amber mica registered in 1933 and 1934 was well maintained, and dealers reported an active demand for trimmed sheet of all sizes. As for some years past, most of the output came from mines in Quebec province.

The adoption by dealers of knife-trimming, in place of the old thumb-trimming methods, has been a step forward and has been received with satisfaction by the British trade, which has always taken exception to the large amount of waste contained in Canadian thumb-trimmed mica. The better grades of Canadian mica are considered superior in point of heat-resistance to much of the Madagascar product, and with the improvement in trimming practice, Canadian dealers should be in a position to establish themselves firmly in the British market.

The mica-grinding plant at the Blackburn mine in Templeton township, Que., continued in operation throughout the year and reported about double the volume of sales over 1934: most of the powder produced goes to the roofing and rubber trades.

Prices showed little change from those of 1934, dealers' quotations at the close of the year being as under:—

Knife-trimmed sheet	Per pound
1 x 3 inches.	35c.
2 x 3 inches.	50–55c.
2 x 4 inches.	75–80c.
3 x 5 inches.	$1.25–$1.35
4 x 6 inches.	$1.75–$1.85
5 x 8 inches.	$3.00

Splittings	Per pound
1 x 1 inches.	48c.
1 x 2 inches.	50c.

Ground mica: 20 mesh, $25 per ton; 60 mesh, $30; 120 mesh, $45: all f.o.b. Ottawa, in ton lots.

Exports of mica of all classes in 1935 were valued at $75,950, as compared with $117,802 in 1934. While the trade in trimmed sheet has improved, there has been a considerable decline in the exports of mica splittings, owing to the competition of cheaper foreign splittings in the world market. This condition is reflected in the value of mica imports, also, which rose from $62,680 in 1934 to $66,801 in 1935, most of such imports being splittings.

ISSUED BY THE MINES BRANCH,
DEPARTMENT OF MINES, OTTAWA,
FEBRUARY. 1936. (H.S.S.)

38. MOULDING SANDS (NATURAL BONDED) IN 1935

Producing Localities

Every province with the exception of New Brunswick and Prince Edward Island is producing some grade of moulding sand; at one time there was a small production at Notre Dame in Kent county and at Irishtown in Westmorland county of the former province; at Charlottetown in the latter province a local sand had at one time found a limited use.

In Nova Scotia deposits are being worked or have been worked in the following counties: Colchester, Cumberland, Hants, Inverness, Kings, and Pictou.

In Quebec deposits are being worked or have been worked in the following counties: Argenteuil, Brome, Joliette, L'Assomption, Missisquoi, Portneuf, and St. Hyacinthe.

Ontario is the leading province in this industry with the greatest development in Welland and Wentworth counties from Niagara Falls to and around Hamilton. Deposits also are being worked or have been worked in the following counties: Brant, Bruce, Durham, Essex, Grenville, Haldimand, Kent, Leeds, Lennox and Addington, Middlesex, Norfolk, Peterborough, Prince Edward, Stormont, and Thunder Bay district.

In Manitoba deposits are being worked or have been worked at Brandon, Melbourne, and Mile 80 (Wye) on the Greater Winnipeg Water District railways.

In the following provinces some foundries are using or have used supplies from or near the places enumerated as follows: Saskatchewan—Humboldt, Moose Jaw, Pilot Butte, Prince Albert, and Saskatoon; Alberta—Calgary, Edmonton, Leduc, Lethbridge, and Medicine Hat; British Columbia—Cranbrook, Holmwood, Metchosin, Nanaimo, New Westminster, Penticton, and Victoria.

Important Developments and Prospective Producing Localities

Development work is being done on a new deposit of moulding sand in Askin township, Nipissing district, Ontario. Since 1931 a grade of moulding sand not commonly available before in the west, suitable chiefly for medium to heavy weight castings, has been obtained from Edmonton.

A good prospective producing locality for moulding sand suitable for medium to heavy weight castings exists about one mile southeast of Langham, Saskatchewan.

For several years past the Mines Branch has been conducting a general investigation into "Natural Bonded Moulding Sands of Canada," with particular reference to available data concerning all known deposits. Outstanding features shown by this investigation are the large number of deposits from which supplies have been used for local foundries and the probability of replacing some imported material with Canadian sands.

Production and Trade

The Canadian production in 1934 was 13,229 tons valued at $13,415. The revised figures of production for 1934 show that the industry has had the best year since 1930. No exports were recorded.

Canada imports more natural bonded moulding sand than she produces. The greatest part of this importation is from the United States with small quantities from Great Britain and France. No definite record of the amount imported is available as there is no single customs classification covering this item. It is estimated that 50 to 60 per cent of our consumption of such sands is imported. Moulding sands as well as other sands and gravels; and sands, silica, for glass and carborundum manufacture, and for use in steel foundries enter Canada duty free.

Small quantities of moulding sands, not tabulated in the official records, are produced in nearly all the provinces by many foundrymen for their own use from nearby deposits; or by small operators as farmers for local foundries.

Silica sands without clay bond which are used in steel foundries are not included in the above production figures. Such sands are dealt with under "Silica" (No. 45).

The industry gives only seasonal occupation to producers as foundrymen usually order their supplies in the summer and autumn months.

ISSUED BY THE MINES BRANCH,
DEPARTMENT OF MINES, OTTAWA,
FEBRUARY, 1936. (C.H.F.)

39. PYRITES IN 1935

Ores Mined and Producing Localities

By-product pyrites was produced in the treatment of copper-pyrites ores at the Eustis and Aldermac mines in Quebec, and at the Britannia mine in British Columbia.

Important Developments

There have been no important new developments during the year. The Freeman flash-roasting plant, installed in the St. Lawrence mill of the Consolidated Paper Corporation, Ltd., at Three Rivers, Quebec, underwent some further improvements to increase its capacity, and was in operation during most of the year. This unit at present is supplying all the sulphur dioxide and much of the steam required for the operation of the sulphite plant in which four standard newsprint machines are in operation; the plant utilizes flotation concentrate produced at the Eustis mine, near Sherbrooke, Quebec.

There is no general market in Canada for lump pyrites and none is produced. Although the Freeman process of flash roasting, especially designed for treatment of by-product flotation fines recovered in the treatment of copper ore, has opened a prospective market for this class of ore, still it is not to be assumed that the mining of pyrites will be stimulated. Ample supplies of pyrites fines are already available at strategic points to care for any demand which may arise in the immediate future. Canada exported about 15,500 tons of pyrites to the United States and Japan; these shipments were made both from Quebec and British Columbia.

Production and Trade

No separate records are available showing the quantity of pyrites produced anually in Canada. In Canada there does not appear to be any standard price for sulphur in pyrites; most contracts are probably based on a price of 5 cents (or slightly better) per unit of sulphur (22·4 pounds) per ton, f.o.b. cars at point of production.

There were no imports of pyrites; exports of raw ore are not recorded but the sulphur content of the concentrate exported amounted to 7,610 tons valued at $48,446; in the previous year 9,821 tons of sulphur were contained in exported concentrate, valued at $94,623. It may be assumed that the exported concentrate contained about 50 per cent of sulphur.

ISSUED BY THE MINES BRANCH,
DEPARTMENT OF MINES, OTTAWA,
FEBRUARY, 1936. (A.W.G.W.)

40. SALT IN 1935

Ores Mined and Producing Localities

Common salt (sodium chloride) is obtained in two forms, in solution in a brine from which the salt is extracted by evaporation, and in lump or solid form by direct mining.

During the year 1935 salt was produced in southern Ontario; at Malagash, Nova Scotia; Neepawa, Manitoba; and from Simpson, Saskatchewan. Ontario salt is obtained from brine wells, as is also the salt produced in Manitoba and Saskatchewan, and the Malagash salt is recovered by mining rock salt, as well as by recovery by evaporation from brines produced by leaching of salt from the waste material in the mines.

Important Developments and Prospective Producing Localities

There were several important developments in the Ontario field during the year. The Warwick Pure Salt Company, Limited, drilled a new well 100 feet west of its old well, to a depth of 1,320 feet. The installed capacity of the plant is 25 tons per day and brine is being drawn from both wells. The Walker Salt Corporation, Port Franks, Ontario, brought its plant into production during the first half of the year. This plant consists of one direct-fired open pan, producing coarse salt which is marketed locally, and during the latter part of the year the corporation installed a rotary dryer which should be in operation early in 1936, thus enabling it to supply a wider market. Additions to the plant are contemplated during the coming year.

The plant of the Canadian Industries, Limited, at Cornwall, Ontario, manufacturing caustic soda, chlorine, and hydrochloric acid, using salt from the company's plant at Sandwich, Ontario, operated throughout the year and supplied these products to the markets in eastern Canada.

The Brunner Mond Company at Amherstburg, Ontario, completed its plant to recover calcium chloride from the waste material resulting from the manufacture of soda ash from salt brine and is now in a position to supply this material to the trade.

In Nova Scotia, the Malagash Salt Company showed a substantial increase over 1934. Each year the products from this plant are finding wider markets.

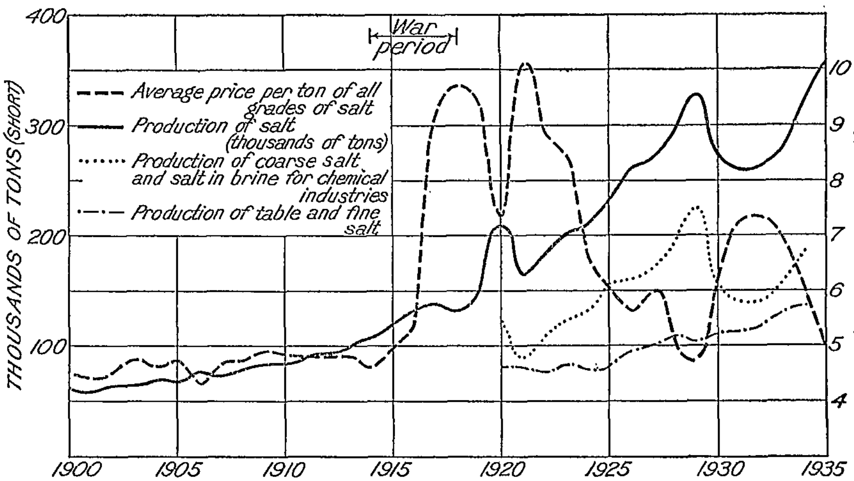
The Neepawa Salt Company, of Neepawa, Manitoba, now part of the Canadian Industries, Limited, maintained steady production throughout the year, numerous alterations being made for better efficiency. Drilling of a second well was commenced in order to explore the possibilities of the brine supply and at the end of the year the well was down nearly to the brine horizons encountered in the first well.

The Simpson Oil and Gas Company, at Simpson, Saskatchewan, operated its plant during part of the year, but devoted most of its effort to the sinking of a second well.

At McMurray, Alberta, several drill holes have encountered salt formation and a number of years ago The Alberta Salt Company produced an excellent grade of salt in this district. Endeavours have been made during the year to revive the salt industry in this area, and it is probable that a plant will be erected at McMurray and production commenced during 1936.

In a well drilled for oil a number of years ago near Gautreau, New Brunswick, south of Moncton, extensive beds of rock salt were encountered between depths of 1,300 and 1,800 feet. A second well penetrated 890 feet of salt formation, some of the salt beds being 150 feet thick. So far these salt beds have remained unexploited, but further prospecting may be carried on to determine their extent, and it is probable that this district will become a producer when conditions warrant.

Near Amherst, Cumberland county, Nova Scotia, a well, put down by the Imperial Oil Company, in a search for oil and gas, encountered 3,200 feet of alternating beds of salt, anhydrite, dolomite, limestone, and shale, the salt constituting 45 per cent of the whole. Salt was met at a depth of 920 feet from the surface, and one of the salt beds which had a thickness of over 480 feet contained over 90 per cent sodium chloride in the crude sample. The apparent great thickness of the salt may possibly be due to the steep dip of the beds.



Salt production and price trends in Canada, calendar years 1900-1935.

Production and Trade

Canada produced 360,343 tons of salt valued at $1,880,978; in 1934 the production was 321,753 tons valued at $1,954,953. The exports of salt from Canada in 1935 were 9,045 tons valued at $51,239. The imports of salt were 128,246 tons valued at $526,740, as against 138,794 tons valued at $586,033 in 1934. The greater portion of this import of salt comes into Canada free of duty for use in the fisheries on the Atlantic and Pacific coasts.

The production, except for small exports, is sold in Canada, principally to the dairy, meat-curing, canning, fisheries, and chemical industries, and as table salt for household use. The production during 1935 showed a 10 per cent increase over the preceding year, and taken over a period of years, the market for salt in Canada is steadily increasing and the industry is in a sound condition. The production for 1935 marks an all-time record, exceeding the former high record in 1929 by over 7 per cent. The accompanying chart depicts graphically the general trend of production. The production curve shows, with the exception of the three years 1920, 1929, and 1931, a steady increase. The increase in 1920 is due to the starting of the chemical industries in Canada using salt as a basic raw product for the production of caustic soda, chlorine, and soda ash. Production fell slightly during 1921, but rose rapidly during the next few years, reaching a peak in 1929. The rapid falling-off in the production of all commodities in the next two years, especially in pulp and paper and the glass industries, which took the major production of the sodium compounds made from salt, is well shown on the chart. From 1932 the rise is again marked, production increasing rapidly. From 1900 to 1916 the price trend follows closely the production curve, the greatly increased price during the war years being followed by the rapid drop in 1920 due to the increased production of the salt in the brine used in the chemical industries, the price of which for statistical purposes was set at a very low figure. From then on the price trend reacts consistently with the production of the coarse salt and salt in brine for chemical industries; when the production increases there is a corresponding drop in price and vice versa. At the same time the production of table, dairy, and fine salt from 1920 has shown a slight but steady rise without any marked fluctuations. The excessive drop in the price trend during the past few years can also be attributed partly to keener competition among the existing companies.

A large tonnage of salt is still imported duty free, for use in the fisheries, because for many years the only producing district was in Ontario, which is unfavourably situated with respect to the market offered by the Atlantic and Pacific coast fisheries. The production from Malagash has materially aided the fishing industry in the Maritime Provinces, and although the demand for salt, for this use, has been curtailed in recent years, it is gradually improving. Until, however, a deposit on the west coast of Canada is found and exploited, the Pacific coast fisheries will be dependent, to a large extent, on imported salt.

Experiments have been carried on with encouraging results in Nova Scotia and elsewhere for the past few years to determine the effect of a mixture of salt with clay as a surface veneer on gravel highways, in order to decrease, if not entirely eliminate the dust nuisance and heavy maintenance cost of such roads. This matter is now being studied seriously not only by the salt producers in Canada, but by several of the provincial departments of highways, and during the past year over 22 miles of highway in Ontario was treated in this manner. It is too early yet to make any definite statement as to the results obtained until the roads have been under traffic for a year, but, so far, the results achieved warrant further tests. If the producers of salt and others are successful in proving its value for such a purpose, a greatly increased tonnage will result.

An increasing demand for salt for the chemical industries may reasonably be expected, as at present, with the exception of caustic soda, soda ash, sodium sulphate, and acid sodium sulphate, practically all of the sodium products used in Canada are imported.

ISSUED BY THE MINES BRANCH,
DEPARTMENT OF MINES, OTTAWA,
FEBRUARY, 1936. (L.H.C.)

41. SILICA IN 1935

Ores Mined and Producing Localities

The materials produced in this industry are:—

Quartz for smelter flux and ferrosilicon; quartzite for ferrosilicon and silica brick; silica sand for the manufacture of glass, carborundum, sodium silicate, etc., also for sandblasting and for use in the steel foundries; silex, the finely pulverized silica used in ceramics and the paint industry.

Quartz and quartzite in sizes from 2 to 6 inches are used in the manufacture of ferrosilicon and as a smelter flux. For silica brick, quartzite is crushed to about 8 mesh. Some quartz is also crushed to make silica sand.

Silica sand is generally prepared from a friable sandstone by crushing, washing, drying, and screening to recover different grades of material according to the industry for which it is required. For example, for the manufacture of glass the material should range between 20 and 100 mesh. Silica sand is also prepared from a friable quartz and from vein quartz.

Silex is the washed sand or pure quartz crushed and ground in some form of ball mill, then either air- or water-floated to recover the fine flour. The ceramic industry requires 150 mesh or finer, while the paint trade requires air-floated material 250 mesh or finer.

Quartz is produced in Quebec and Ontario; and quartzite is quarried in Nova Scotia, Quebec, Ontario, Manitoba, and British Columbia. Silica sand is obtained from Nova Scotia, Quebec, and Manitoba, and silex is prepared at one plant in the province of Quebec.

Important Developments and Prospective Producing Localities

The Ottawa Silica and Sandstone Company, Templeton, Quebec, is producing sand of different grades for steel foundries, the glass industry, and for sandblasting, etc.

The Canadian Kaolin Silica Products, Ltd., from its property at Lac Rémi, Quebec, is making regular shipments of silica sand to the glass companies and others in the Montreal district.

The National Silicates, Ltd., a subsidiary company of the Philadelphia Quartz Company of Philadelphia, Pennsylvania, in association with G. F. Sterne & Sons of Brantford, Ontario, operated at Toronto, to full capacity, its plant for the manufacture of silicate of soda. The North American Cyanamid Company of Niagara Falls, Ont., operated two furnaces for the manufacture of silicate of soda throughout the year. Although both firms are using imported silica sand, they form a ready market for material from a Canadian deposit when any producer can guarantee continuous supply of a product sufficiently pure to meet the rigid specifications required.

Flint Sands, Ltd., a company formed in 1934 for the purpose of developing the loosely consolidated sandstone deposit at Guigues, Quebec, 11 miles north of Ville Marie, operated a small drying and screening plant and shipped sand of various grades to the Ontario market.

General Refractory Products, Ltd. is developing a deposit of refractory clays 7 miles north of Smoky Falls, Ontario. Associated with these clays are beds of silica sand, which the company intends to separate and clean to a purity satisfactory for several of the silica sand markets. Tests made in the laboratories of the Mines Branch, Ottawa, on a four-ton sample gave a product sufficiently low in iron and other impurities for use in the manufacture of the best grades of glass. This company plans to erect a small mill during the summer of 1936.

The Chromium Mining and Smelting Company, Ltd. has established a plant at Sault Ste. Marie, Ontario, and is manufacturing ferrosilicon, using silica from several Canadian sources for one of its raw materials.

In the use of silica for a flux, the smelters endeavour to obtain their material from the nearest possible source, and in many cases they prefer a siliceous ore containing small values in the precious metals. For the manufacture of ferrosilicon and silica brick, the market for the finished product limits the quantity of silica required, and as both these industries showed an improvement, the consumption of silica for these uses increased accordingly.

The demand for high-grade silica sand remained steady and though appreciable quantities of Belgian sand are still brought into Montreal as ballast at a comparatively low cost, it is gratifying to note the willingness of the consumers of this grade of silica to use the Canadian product whenever suitable Canadian material is offered. The Canadian producers of silica sand are steadily improving their position and each year sees an increasing use of their products. Silica sand for use in the manufacture of glass and silicate of soda is at present largely imported; it has to be of a high degree of purity and uniformity; and if Canadian producers hope to supply this market they will have to adhere rigidly to the strict specifications and be able to guarantee regularity of shipments.

The use of Canadian sand for sandblasting is increasing and the prospects are promising for a still further use of Canadian material.

Production and Trade

The total tonnage of quartz and silica sand produced in Canada in 1935 amounted to 229,848 tons valued at $423,968; the production in 1934 was 272,563 tons valued at $482,265. There were 2,461 M silica brick produced in 1935 at a value of $96,194; in the previous year the production was 2,528 M valued at $85,945. No exports of silica or silica products were recorded during the year. The tonnage of the various grades of silica imported during 1935 amounted to 129,212 tons with a value of $382,712, compared with 100,828 tons valued at $308,045. The imports of silica brick in 1935 were valued at $215,500, as against $210,190 in 1934.

The price per ton for the several grades of silica varies greatly, depending on the purity and on the purpose for which the material is to be used. Silica, on the whole, is a comparatively low-priced commodity, and therefore the location of a deposit with respect to markets is of great importance, as well as the purity of the material. The larger markets for silica are in the provinces of Quebec and Ontario, so that any new deposits being opened up should be within economic reach of either Toronto or Montreal.

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42. SODIUM SULPHATE (NATURAL) IN 1935

(Glauber's Salt and Salt Cake)

Ores Mined and Producing Localities

The material mined is either hydrated sodium sulphate, known as Glauber's salt, or anhydrous sodium sulphate, known to the trade as "salt cake." It occurs as crystals (Glauber's salt) or in the form of partially saturated or saturated brines in many lakes throughout western Canada.

Production was all from the province of Saskatchewan, the principal producers being the Natural Sodium Products, Ltd., Dunkirk, Sask.; Horseshoe Lake Mining Company, Ormiston, Sask.; the Sodium Corporation, Alsask, Sask.; the Midwest Chemical Company, Palo, Sask., and the Dominion Sodium Refineries, Ltd., Fusilier, Sask., with small tonnages from several other properties where small experimental plants have been erected.

Important Developments and Prospective Producing Localities

The Natural Sodium Products, Limited, at Dunkirk, Sask., has installed a third dryer and now has three rotary steel drum dryers, two of which are in continuous operation.

The Horseshoe Lake Mining Company at Ormiston, Sask., was in full operation during the summer months of the year and supplied material for the nitre cake plant at Copper Cliff, Ontario.

The Sodium Corporation at Alsask, Sask., produced a small tonnage during the year as did also the Dominion Sodium Refineries, Ltd. at Fusilier, Sask.

At the central part of Whiteshore lake, the Midwest Chemical Company produced small tonnages from its 50-ton dehydrating plant using direct rotary dryers working on harvested intermittent crystals. The shipping point is at Palo, Sask., a station on the Canadian National railway, 3 miles north of the plant.

The Oban Salt Company, a subsidiary of the Eastcrest Holding and Development Company, with head office at Calgary, Alta., continued its experimental work on preparing high-grade hydrous Glauber's salt preparatory to erecting a dehydrating plant. It is now contemplating the erection of a plant for the preparation of high-grade anhydrous salt suitable for the textile trade.

The interests which took up leases on Muskiki lake, 60 miles east of Saskatoon, Sask., propose using a modification of the solution and crystallization process and have incorporated under the name of Muskiki Sulphates, Ltd. This deposit is the one formerly held by Salts and Chemicals, Ltd., one of the early companies in the industry.

Experimental work carried on during the past year at a number of properties in Saskatchewan by the Sodium Sulphate Company at Ceylon lake, the Canadian Sulphate Company at Berry lake, and others, has not, so far, resulted in commercial production.

Activity has been marked in this industry, and many inquiries were received by the Department for information on various phases, from methods of harvesting and dehydrating to marketing problems.

It is encouraging to note the progress made in this industry in the past few years. The investigation of these deposits was started by the Mines Branch in 1921 and over 120,000,000 tons of hydrous salts was proved in the few deposits examined in detail. In 1921 none of this material was utilized commercially, but such rapid progress was made from that date that in 1934 the revenue derived by the Canadian railways from this industry alone amounted to a sum in excess of $700,000. At the present time the operating plants are capable of producing over 600 tons of dried salts per day. The development of these sodium sulphate deposits has been one of the major factors that has made possible the erection of the plant for separating nickel from copper, at Copper Cliff, Ont., by the Orford process.

Production and Trade

The production of natural sodium sulphate for 1935 amounted to 44,817 tons valued at $343,764; compared with a production in 1934 of 66,821 tons valued at $587,986. Although there were small shipments of sodium sulphate from the deposits in western Canada to the United States, the figures are not shown in the customs reports. The imports of sodium sulphate during 1935, including Glauber's salt, salt cake, and the acid sodium sulphate (nitre cake), amounted to 7,229 tons valued at $88,738; in 1934 the imports were 13,106 tons valued at $153,115.

There was a falling-off in the production of natural sodium sulphate from the deposits of western Canada during the year owing to several causes. In 1934 production from the Canadian deposits was greatly in excess of the estimated consumption and at the end of that year many of the pulp companies as well as the nitre cake plant at Copper Cliff had large stocks of sulphate on hand. In the United States competition from domestic sources, both natural and artificial, also further decreased the amount of Canadian product imported. The anhydrous material prepared in the plants in western Canada has repeatedly been tried in the textile industry but it is claimed that on account of the method employed of drying the material by direct contact with flame, the product is unsuitable for use in dye baths as it causes uneven distribution of the colour on the textiles, probably owing to the presence of particles of carbon in the salts. They are, therefore, using Glauber's salt or anhydrous sodium sulphate imported from Germany. Consequently, until the western producers employ methods of dehydrating other than by direct flame, this market will not be available. The pulp and paper industry has also found that the insoluble and other impurities in some of the shipments from western Canada cause trouble in their process. The larger producers of western Canada are constantly trying to improve the quality of their product and it is only by so doing that they can hope to retain and expand their present market.

The product from these western deposits should find a rapidly extending market, as the by-product material from the manufacture of hydrochloric acid is each year decreasing in volume owing to the manufacture of hydrochloric synthetically. With the steady improvements being made in methods of refining, thus bettering quality of product and reducing costs of production, and with improved facilities for shipment via Churchill, Man., the possibility of the product from these deposits competing in European and other foreign markets looks decidedly promising.

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FEBRUARY, 1936. (L.H.C.)

43. SULPHUR IN 1935

Producing Localities

Deposits of elemental sulphur of commercial grade have not been found in Canada. Sulphur occurs in combination with copper, lead, zinc, nickel, or iron in many base metal sulphide ore-bodies in various parts of Canada. As noted in the article on pyrites, a small quantity of sulphur is recovered annually from by-product concentrate. In addition, wherever sulphide ores are treated to recover the valuable metal content by-product sulphur dioxide gas is a waste product that has a potential value as a source of sulphur for industrial use.

Important Developments

In practice waste sulphur dioxide gas can be used directly for the manufacture of sulphuric acid, for the production of liquid sulphur dioxide, or for the production of elemental sulphur; two plants in Canada (at Tadanac, British Columbia, and at Copper Cliff, Ontario) are now manufacturing sulphuric acid from waste gas. At present no plant in Canada is producing liquid sulphur dioxide from waste gas, although this has been done experimentally. Much experimental research has also been directed towards the development of processes for the production of elemental sulphur either from the waste gas or from the original sulphide ore, and a number of patents on processes have either been issued or are pending. A plant designed to produce about 60 tons of sulphur per day from waste gases is now in process of erection at Trail, B.C.; two other firms are also engaged in research work on this problem.

Production and Trade

The Dominion Bureau of Statistics reports the equivalent amount of sulphur recovered from all sources as 67,446 tons, an increase of about 31 per cent over the previous year; the imports of sulphur in all forms were 136,675 tons valued at $2,297,650 in 1935, as against 157,697 tons valued at $2,589,311 in the previous year.

Canada imports all its requirements of elemental sulphur from the states of Texas and Louisiana. According to trade journals sulphur was quoted at $18 per long ton, f.o.b. cars at the mines; the prices at consumers' plants in Canada vary according to location, reaching a maximum of about $37, the difference being due to transportation costs. The largest single sulphur-consuming industry in Canada is that which produces sulphite pulp and newsprint; other important consuming industries include the sulphuric acid and explosive groups, rubber manufacture, and fertilizer production. Metallurgical industries treating sulphide ores of copper, nickel, lead, or zinc necessarily produce large quantities of sulphur dioxide gas from roasting or oxidizing operations; until recently all these gases were wasted. Some years ago plants to absorb a portion of these waste gases were installed at Copper Cliff, Ontario, and at Tadanac, British Columbia. At the first-mentioned plant the gas is used for the manufacture of high-grade sulphuric acid, the capacity of the units installed being about 150 tons per day of fuming acid; this acid finds a market in numerous industries. In British Columbia the acid made is used chiefly for the manufacture of fertilizers, but a certain proportion is used for other purposes.

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44. TALC AND SOAPSTONE IN 1935

Producing Localities

Nearly all of the high-grade, white talc produced in Canada is derived from deposits at Madoc, Hastings county, Ontario, where two mines have been in steady operation for a number of years. The talc is of the foliated type, and occurs as a series of vertical veins or bands in white, crystalline dolomite. Each mine operates its own mill at or near its property, the ground product being marketed in three grades, according to fineness and purity. Most of the output goes to the textile, cosmetic, paper, rubber, and roofing trades. A large proportion of the output is exported, chiefly to the United States, but also to Great Britain (in part for re-export to continental countries).

In eastern Canada, the only other production of talc (in part soapstone powder) is from a soapstone quarry near Broughton, in the Eastern Townships, Quebec. Crude, lump talc, from a band cutting the soapstone body, and soapstone waste are shipped to a Montreal grinding plant, and the off-colour, grey dust from the sawing benches at the quarry is disposed of to the roofing trade. Samples of the talc, analysed in the Mines Branch laboratories, proved to have a very low lime content, and the material might accordingly have value for ceramic purposes.

The Broughton Soapstone Quarry Company, which operates the deposit mentioned above, was in steady production throughout the year, supplying sawn blocks and bricks for the pulp-mill trade. Shipment is made as far west as Dryden, in western Ontario, but the bulk of the output has found employment in Quebec mills. In addition to furnace stone, the company also fashions soapstone monuments, stoves, mantels, slabs and other interior trim, as well as a variety of turned ornamental objects and crayons. A drying-kiln was installed during the year, for the removal of contained moisture in the sawn furnace stone. This concern was the pioneer Canadian producer of soapstone, and has been operating in the Broughton district for a number of years. During 1934, two other soapstone operators came into production in the same district, in Thetford and Broughton townships; these have installed sawing equipment and shipped smaller amounts of cut furnace blocks; both were in part-time production during 1935. A development which may seriously affect the demand for soapstone for pulp-mill use is the introduction of a new type of water-cooled alkali-recovery furnace; this is of steel construction, only the base being built of soapstone blocks. Such furnaces have already been installed in a number of Canadian and American mills and it is stated that their use is likely to become general.

In British Columbia, there is a small, intermittent production of ground grey talc, utilized chiefly in the roofing trade. The material has been obtained from near McGillivray Falls (Anderson lake), on the P. G. E. railway and from Wolf creek, near Sooke, on Vancouver island. The Anderson Lake material is shipped in the crude form to Vancouver for grinding, and that from Sooke is ground in a small plant at the mine. In 1935, only the Sooke mine was in operation.

Important Developments and Prospective Producing Localities

There were no fresh developments during the year in connexion with either talc or soapstone. Soapstone operators reported a decline in the price of sawn blocks and bricks to $3 per cubic foot. The Broughton Soapstone Quarry Company conducted some exploratory work on a deposit of greyish talc in East Bolton township, near Eastman, Que.; a small mining plant was installed and a shaft sunk to a depth of 40 feet. A small tonnage of the talc was mined and a trial shipment made to the grinding plant of Pulverized Products, Ltd., in Montreal. The material proved to be of off-colour grade and work was suspended in the fall. No further work has been undertaken on the known occurrences of soapstone in western Ontario and near Hope, B.C., or on the steatite deposits on the Alberta-British Columbia boundary, near Castle.

Production and Trade

The total production of ground talc in 1935 was 13,803 tons valued at $139,556; in 1934 the production was 13,959 tons, valued at $136,480. The 1935 production of cut soapstone was valued at $32,053; the value of the 1934 production was $44,297. Exports of ground talc totalled 8,927 tons valued at $90,823 in 1935, compared with 9,386 tons valued at $103,631 in 1934. The 1935 imports were 2,694 tons valued at $44,503, as against 2,897 tons valued at $44,905 in 1934. Prices showed little change from the 1934 level, being $17.50 for the best grades, $11.50 for the intermediate, and $9 for the lowest, all f.o.b. mills at Madoc, Ont.

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FEBRUARY, 1936. (H.S.S.)

45. WHITING SUBSTITUTE IN 1935

Products and Producing Localities

Whiting substitute as made in Canada consists of white limestone, or white marble, pulverized to a fineness of minus 200 mesh, and for some uses to a fineness of minus 325 mesh. It is, as the name implies, used as a substitute for whiting made from chalk, and finds its principal use in the manufacture of oilcloth, linoleum, certain types of rubber products, putty, and explosives. In lesser quantity it is used in the manufacture of moulded articles, cleaning compounds and polishes, as a ceramic glaze, and for a number of other purposes. Until 1934 one Canadian company was making whiting substitute from a white dolomite, but at the present time all the whiting substitute produced in this country is made from pure marble or limestone that contains only a small percentage of magnesium carbonate, and the chief differences between the Canadian material and chalk whiting are that the former has a lower capacity for absorbing oil and the individual particles are inclined to be sub-angular rather than rounded. Whiting substitute made from a magnesium limestone or dolomite is not suitable for certain uses, particularly in the rubber industry, whereas a whiting substitute nearly free from magnesium carbonate is suitable for all uses.

Whiting substitute is manufactured by Pulverized Products, Ltd., Montreal, and by Gypsum, Lime and Alabastine, Canada, Ltd., at Winnipeg. A finely pulverized limestone product approximating whiting substitute in colour and fineness is produced by F. J. Beale at Vananda, Texada island, British Columbia.

Important Developments and Prospective Producing Localities

There have been no important developments in connexion with the production of whiting substitute during the year. Considerable interest is being taken in the possibilities of making this product from certain of the numerous undeveloped deposits of marl, calcite, and white marble in various parts of Canada, but no new developments have as yet taken place. It may be said that, in general, marl deposits, because of their content of organic matter, have little possibility of yielding material suitable for making whiting substitute.

Closely related in uses to whiting substitute are precipitated chalk and by-product precipitated chalk. Neither of these products is made in Canada, although the raw materials for each are available. The former is made by re-carbonating a milk-of-lime made from high-calcium quicklime and is characterized by its high degree of fineness and by its freedom from grit and other impurities. By-product precipitated chalk is made from the waste sludge resulting from the manufacture of caustic soda from soda ash and lime. It almost invariably contains a small amount of free alkali and this restricts its usefulness.

Production and Trade

No separate record is kept by the Dominion Bureau of Statistics of the production, imports and exports of whiting substitute, but the industry has experienced a steady growth in recent years because the maintenance of close technical control has enabled a product to be marketed that is very consistent in both chemical and physical properties, and many manufacturers are now using the Canadian product in place of imported chalk whiting with entire satisfaction. There is little or no export of whiting substitute from Canada but there is a considerable quantity of specially processed whiting substitute imported from the United States. Imports of chalk whiting in 1935 amounted to 12,333 tons valued at $118,451, as compared with imports of 12,034 tons valued at $119,643 in 1934.

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FEBRUARY, 1936. (M.F.G.)

46. MISCELLANEOUS MINERALS IN 1935

There are a number of minerals that have been found in Canada whose production has either never reached a commercial stage, or whose production is of small value or has entirely ceased. The more important of these are briefly mentioned in the following paragraphs.

Barite. Numerous occurrences of barite are known in Canada, and at one time there was a small barite mining industry. Competition of cheaper foreign material, however, has led to an almost complete cessation of mining, and production has been negligible for many years. Most of the output has come from deposits in the Lake Ainslie district, in Nova Scotia, and is consumed locally. Other deposits are known in Colchester, Hants, and Pictou counties, Nova Scotia, but no mining has been conducted on them for many years. Some of the crude ore produced was used by domestic paint manufacturers but the bulk of the output was exported. The much stricter specifications of modern industry make it improbable that there will develop any important market for crude run-of-mine ore, and any future development will require the provision of concentrating and milling equipment to prepare a product of the purity and fineness demanded by the trade. Barite also occurs in Quebec, northern and western Ontario, and British Columbia. The northern Ontario deposits have attracted the most attention in recent years and a few small shipments of both crude and milled ore have been made. A modern mill was installed a few years ago on a deposit in Langmuir township, but the property was closed down without coming into commercial production. Some interest has also recently been taken in the possibility of shipping barite from this region for export to Trinidad for oil-drilling, the material being used for weighting the drilling mud. High rail freight rates, however, have so far proved a serious obstacle to barite development in northern Ontario. There being no lithopone or barium chemicals industry in Canada, no demand exists at present for crude ore: domestic requirements for prime powdered barite are met by imports of German and American (Missouri) material.

Imports of powdered barite into Canada in 1935 totalled 2,139 tons, valued at $33,739, compared with 1,557 tons, valued at $26,397, in 1934. (H.S.S.)

Bentonite. There are numerous occurrences of clay of bentonitic type in the Prairie Provinces and several deposits are also known in British Columbia. These deposits are probably adequate to fill domestic requirements, but so far little serious interest has been shown in developing a home industry and most of the bentonite used in Canada, both powdered crude and activated, is imported from the United States. The greater part of the small domestic production has come from deposits at Princeton, B.C., the material being shipped to Vancouver for grinding: the product has been used chiefly in oil and gasoline refining and as a concrete admixture. A production of only 41 tons valued at $781 was reported, as against 63 tons valued at $1,578 in 1934. Production of bentonite has been expanding rapidly in the United States in recent years, the crude, pulverized clay finding employment in many industries. A large proportion of the output is employed in the foundry industry, where it is used in core washes and to rejuvenate spent moulding sands. It is also used in emulsions of various types, asphalt and concrete, oil-drilling muds and cements, detergents and sizes, insecticides, ceramic materials, and a wide range of other products. Some bentonites, on " activation " (treatment with sulphuric acid), acquire high bleaching power, and in this form are extensively used in oil and gasoline refining, decolorizing animal and vegetable fats, oils and greases, and clarifying liquids such as wines, vinegar, honey, etc. The bleaching power of such activated clays has been found to be from two to five times greater than that of fuller's earth, the material formerly used for the purpose. An investigation of the bleaching properties, both in the crude and activated state, of a number of Canadian bentonites has been under way in the laboratories of the National Research Council, at Ottawa, for the past two years. (H.S.S.)

Beryl. The mineral beryl, a silicate of aluminium and beryllium, with 12 to 14 per cent beryllium oxide, is the only important known source of the element beryllium: its occurrence is confined to pegmatite dykes where it usually is found in the form of disseminated crystals. A large proportion of the beryl sold represents by-product material from the working of pegmatites for their feldspar or mica content. Beryl-pegmatites are known in a number of countries, and small tonnages have been produced in various states in the United States, in India, South Africa, Brazil, Madagascar, Scandinavia, France, Portugal, Spain, and Russia. The total amount so produced and sold annually in recent years has been only a few hundred tons, but it is believed that the known reserves are capable of meeting considerably increased demand. Until a few years ago, beryllium held little commercial interest, owing chiefly to the exceedingly high cost of extraction of the pure metal. This cost has now been reduced to a point that enables its valuable properties to be utilized in industry and the production of beryllium alloys, chiefly copper-beryllium and nickel-beryllium, is expanding rapidly. Beryllium imparts high tensile strength to copper, and tools made of the above alloys have the valuable properties of hardness and toughness, approaching that of steel, and of being non-sparking.

Known deposits of beryl of possible commercial importance in Canada include an occurrence in Lyndoch township, Renfrew county, in Ontario, and several scattered occurrences in the Pointe du Bois district, in southeastern Manitoba. The first-named probably offers the best chances for development: it has been worked on a small scale at various times and has yielded a few tons of beryl crystals from small surface pits. The dyke is at present being worked for feldspar, and it may prove possible to win both minerals simultaneously. The dyke also carries rose quartz, columbite and amazonite. Some of the Manitoba pegmatites carry beryl as scattered crystals, sometimes of large size, and a few rich pockets of limited extent have been found in which the beryl, as small crystals, constitutes possibly 50 per cent of the rock. So far, there has been no attempt at production. Occasionally yellow, green or colourless crystals are found, and a small amount of such material has been cut into gem stones for the local Winnipeg jewellery trade. (H.S.S.)

Fluorspar. Few important occurrences of fluorspar are known in Canada, and practically the whole of the domestic requirements for the metallurgical and ceramic industries is imported. The only localities where the mineral occurs in important amount are the Madoc district, in

Ontario, and near Grand Forks, British Columbia. During the war period, active mining was conducted on a number of properties in the Madoc area, with the production of considerable tonnages. In recent years, however, output has been on a very small scale and practically all the mines have been idle. The Rock Candy mine of the Consolidated Mining & Smelting Company, near Grand Forks, B.C., represents by far the largest known deposit of fluorspar in Canada. The mine has been operated intermittently since 1918, the last occasion being in 1929, when nearly 18,000 tons were produced; the total output is estimated at around 50,000 tons.

In 1935, the small recorded tonnage of 225 tons, valued at $2,700, was all recovered from small surface workings and waste dumps in the Madoc area. In the previous year the production was 150 tons valued at $2,100.

Imports of fluorspar into Canada in 1935 were 11,591 tons valued at $92,775, compared with 7,220 tons valued at $56,628, in 1934. The material came chiefly from Great Britain (5,168 tons), United States (3,325 tons), Spain (1,680 tons), Newfoundland (1,094 tons), and Germany (324 tons). (H.S.S.)

Garnet. Garnet, crushed, screened, and suitably sized, is used for making abrasive-coated papers and cloths for rather clearly defined special uses in certain manufacturing industries. About 140 tons of prepared garnet now used in Canada is being imported as graded grains, there being no Canadian production. Attempts to produce suitable garnet grains in Canada have been made, but no commercial development has followed, partly because the existing market is a very small one and partly because suitable and accessible material has not been located in sufficient quantity. In 1935, five or six carlots of garnetiferous rock were crushed and screened at a mill near Labelle, Quebec, and were sold for sandblasting purposes. (V.L.E.-W.)

Lithium Minerals. The principal commercial lithium ores are amblygonite, a fluophosphate of lithium and aluminium; spodumene, a silicate of these two elements; and lepidolite, or lithia mica, also a silicate. The lithia content of these minerals, as mined, commonly ranges from around 8 to 9 per cent for amblygonite, 4 to 8 per cent for spodumene, and 3 to 5 per cent for lepidolite. The minerals triphylite and lithiophilite respectively, phosphates of lithium, with either iron or manganese and carrying theoretical contents of lithia as high as 8 to 9 per cent, are also classed as lithium ores. They, however, are rarely met with in commercial quantities and, in addition, have often lost a large proportion of their original lithia by natural leaching. All of the above minerals are known to occur in Canada, but there has as yet been only a small production, mainly of lepidolite and spodumene. The important deposits are all in Manitoba, chiefly in the Pointe du Bois region in the southeastern part of the province, where a number of lithium-bearing pegmatites have been located. The first discoveries were made in 1925, and intermittent mining and development work has been undertaken at various times, most of it conducted on the Silver Leaf property (the original discovery point), on the south side of Winnipeg river, and on the Buck claims at Bernic lake, between Winnipeg and Bird rivers. From the Silver Leaf mine, a couple of trial cars of lepidolite and spodumene were shipped between 1925 and 1928, but there has been little further work done. At Bernic lake, a number of outcrops of lithium minerals were found in 1930 during prospecting operations for tin, and about 100 tons of spodumene and 50 tons of amblygonite were mined and stock-piled; there has been only a minor amount of work done since that year and no shipments have been made. The Lithium Corporation of Canada, of Winnipeg, which controls the deposits, reports a little further prospecting in 1935 on some of the claims, but no mining: the company's plans for establishing a lithium chemicals industry in the province have not yet materialized. Prospecting has disclosed other lithium occurrences, mainly of spodumene, at Cat lake, north of the Bird river, and also in the Wekusko Lake district, near Mile 81 on the Hudson's Bay railway; no attempt at development of these remote deposits has been made.

Lithium minerals serve as the raw material for the manufacture of lithium chemicals and lithium metal and alloys. Lepidolite, which contains relatively low percentages of lithium, is also used, as such as an ingredient of certain types of glass, particularly those of the heat-resistant (Pyrex) type. The lithium chemicals trade is a comparatively restricted industry, and the world consumption of lithium salts has shown little expansion over a period of years. Some interest is currently being shown in the use of lithium chloride as a drying agent in air-conditioning, the salt being one of the most hygroscopic inorganic compounds known. The growing application of air-conditioning in industry may lead to an increased demand for lithium minerals for the manufacture of the chloride. A recent development, also, is the perfection of a process for making lithium fluoride in the form of single crystals having valuable optical properties. (H.S.S.)

Magnesium Sulphate. Natural hydrous magnesium sulphate (Epsom salts) occurs in brine-bearing lakes in British Columbia and in association with sodium sulphate in Saskatchewan. Attempts have been made on several occasions to produce refined salts from some of the deposits which occur; there was considerable production a number of years ago from several of the lakes in British Columbia and experimental shipments from one of the lakes in Saskatchewan. In 1933 a small experimental plant, said to have a daily capacity of 3·5 tons of refined Epsom salts, was erected at Ashcroft, B.C., to treat the crude salts recovered from lakes at Basque, B.C.

Epsom Refineries, Ltd., the company operating this deposit and plant, has during the past year remodelled and enlarged its plant at Ashcroft and is at present in a position to produce from 7 to 10 tons of refined salts per day. This production is marketed principally in the tanning and medicinal industries.

The production in 1935 was 340 tons valued at $7,965, as against only 42 tons valued at $1,100 in 1934.

The imports in 1935 were 1,842 tons valued at $40,407, as against 2,300 tons valued at $48,459 in the previous year. (L.H.C.)

Peat Fuel. There is very little activity on peat bogs in Canada, except for some digging for local use; there are at least five localities in Ontario and one in Quebec where air-dried peat was being produced for local use; one other partly developed bog in Ontario was idle during 1935. The Ontario production that has been reported was 1,340 tons valued at $5,761 in 1935; in the previous year the production was 1,878 tons valued at $7,343. It should also be noted that moss litter and moss insulating material were produced at five other bogs located respectively in the provinces of New Brunswick, Quebec, Manitoba, Alberta, and British Columbia. (A.W.G.W.)

Phosphate. The only important recorded occurrences of phosphate rock in Canada are the Precambrian apatite deposits of the Ottawa-Kingston region, in Ontario and Quebec, and the rather low-grade sedimentary phosphate of the Crowsnest district just west of the boundary between southern Alberta and British Columbia. The production of apatite has been almost negligible for many years, with the single exception of 1932, when there was a small revival of mining along the Lièvre river, in Quebec, with a reported output of 1,316 tons. The apatite occurs in mica-bearing pyroxenites, and most of the small production during the last twenty years has represented by-product material won during mining operations for mica (phlogopite). The apatite is mostly sold to the Electric Reduction Company, at Buckingham, Que., for the production of phosphorus. This company reported purchases of 165 tons of apatite in 1935, of which 115 tons came from the Lièvre River district, Que., and 50 tons from the Kingston district, Ont. The Crowsnest sedimentary phosphate was discovered some years ago as the result of extensive prospecting by the Consolidated Mining and Smelting Company for phosphate rock to supply its new fertilizer plant at Trail, B.C. Mining operations were conducted at two localities in the Crowsnest-Michel area, and several experimental shipments were made to Trail. The rock, however, is of rather low grade and did not prove amenable to concentration; the company, therefore, discontinued operations and at present draws its supplies from Idaho and Montana, where higher-grade material is available. Eastern Canadian plants using phosphate rock for fertilizer and other purposes obtain their supplies mainly from Florida or Tennessee; there have also been some importations from Morocco in recent years.

The production of phosphate in 1935 was 186 tons valued at $1,103, as against 81 tons valued at $683 in 1934.

Imports of phosphate rock into Canada in 1935 totalled 63,514 tons valued at $234,580, as against 31,775 tons valued at $165,240 in 1934, an increase of 100 per cent in quantity and 42 per cent in value. Practically the entire amount came from the United States. Canada also imported 67,204 tons of superphosphate valued at $595,330 in 1935. (H.S.S.)

Sodium Carbonate (Natural). Deposits of natural sodium carbonate, in the form of "natron" (sodium carbonate with 10 molecules of water) and also as brine, occur in a number of "lakes" throughout the central part of the province of British Columbia, chiefly in the Clinton mining division, around 70 mile house, and in the neighbourhood of Kamloops. Since 1921 there has been a small intermittent production from several of these deposits, the product obtained being marketed in Vancouver, B.C., for use in soap manufacture.

During the past year (1935) a small production was made from a lake near Cherry Creek, 13 miles west of Kamloops. Here the crude salts occurring in the deposit are put into solution by means of steam, the insoluble impurities in the original salts being allowed to settle out in the resultant brine after which the clarified brine is pumped to a specially prepared reservoir for crystallization. From this reservoir the crystals are harvested and shipped to Vancouver for use in the manufacture of soap. From 10 to 12 carloads are recovered annually in this way. The product shipped contains an appreciable percentage of sodium sulphate.

Production in 1935 was 242 tons valued at $2,430, almost equal to the production in 1934, which was 244 tons valued at $1,920. (L.H.C.)

Titanium. Ilmenite, carrying from 18 to 25 per cent titanium, is known to occur at several places in the province of Quebec and small shipments have been made from time to time from deposits at St. Urbain in Charlevoix county and at Ivry in Terrebonne county.

In 1927, the Ivry deposits were acquired by Titanium (Canada), Ltd., for the purpose of manufacturing titanium-white, but nothing materialized and the company is apparently still dormant.

In recent years shipments have been made from St. Urbain—where the General Electric Company has a mine—to the same company's manufacturing plant at West Lynn, Mass. Other shipments from St. Urbain have gone to Niagara Falls, N.Y., presumably to the Titanium Alloy Manufacturing Company's plant.

In so far as is known, no active steps have yet been taken to establish a titanium-using industry in Canada.

It is reported that in 1935 E. I. du Pont de Nemours and Co., Inc., of Wilmington, Delaware, U.S.A., acquired an ilmenite property at St. Urbain, Que., from which a small tonnage was shipped for experimental purposes.

The production in 1935 was 2,288 tons valued at $16,016, as against 2,023 tons valued at $14,161 the previous year.

The Titanium Pigment Co., of New York, reports the production on a semi-commercial scale of a new pigment-lead titanate ($PbTiO_3$)—made by combining lead monoxide with titanium dioxide at a high temperature. It is said to be a specially desirable constituent of paints where extreme durability and protection are major considerations and the necessity for whiteness does not exist. (A.H.A.R.)

Volcanic Dust. Volcanic dusts are found in Saskatchewan, Alberta, and British Columbia. The material is used both as a filtering medium and as a filler, as well as an abrasive. There has been intermittent production from near Swift Current, Saskatchewan, and from near Williams Lake in British Columbia, but none was sold in 1935. The total production in 1934 was 31 tons valued at $320. Imports are not separately recorded but are grouped with a number of similar products—pumice, pumice stone, lava, and calcareous tufa. These products, to the value of $30,971, were imported in 1935; in 1934 the value of these imports was $25,142. (V.L.E-W.)

ISSUED BY THE MINES BRANCH,
DEPARTMENT OF MINES, OTTAWA,
FEBRUARY, 1936. (Staff Mineral Resources Division.)

47. COAL IN 1935

Producing Localities

The provinces of Nova Scotia and New Brunswick, and the Yukon Territory, produced only bituminous coal. Coal produced in the province of British Columbia is almost all bituminous, except for a small quantity which is classified as lignitic. The production of coal in the province of Alberta includes bituminous, sub-bituminous, and lignite coals, while the provinces of Saskatchewan and Manitoba produced only lignite coal.

Important Developments and Prospective Producing Localities

Developments in Nova Scotia include changes and improvements to the washing and screening plant of the Dominion Steel and Coal Corporation. These changes permit of a wider range of preparation of coal for special purposes. A program of consolidation of the various collieries operated by this company has been under way for the past few years, and progress in this direction was accomplished in 1935, the objective allows for an increased production, at a decreased cost, by the ultimate construction of cross-measure tunnels, cutting the coal seams at depths sufficient to allow the total extraction of the coal in the submarine area.

In Alberta the strip mining operations in the Sheerness area have been extended during the year. The new collieries opened up by the Canadian Pacific Railway near Lethbridge have been in operation for a portion of the past year. The additions mentioned in the 1934 Review, to the wet-washing and air-cleaning plants of the various mines in Alberta have been completed and are in operation. An intensive program of experimentation is under way by the West Canadian Collieries on the cleaning of coal from this area. A jig of special design has been developed and is in satisfactory operation.

An important development in the Crowsnest Pass area has been the consolidation of the management of the mines operated formerly by the McGillivray Creek Coal and Coke Company and the International Coal and Coke Company, which are now under financial control of one organization.

The program of mechanization of coal mines throughout Canada has made progress during the year, and advances have been accomplished in the special preparation of coal to meet the demands of specialized requirements of the market.

Production and Trade

Canada's coal output in 1935 amounted to 13,864,577 tons; this represented an advance of 0·39 per cent over the 1934 total of 13,810,193 tons. Mines in Nova Scotia produced 5,808,420 tons, which is a decrease of 8·4 per cent from the production of the preceding year. New Brunswick's production amounted to 342,333 tons, an increase of 8·8 per cent from that of the previous year, and the largest in the history of the industry in that province. Manitoba produced 3,106 tons during 1935, which was a decrease from the previous year's output. Saskatchewan's output increased as compared to 1934, the totals being 919,477 tons and 909,288 tons, respectively, thus representing an increase of 1·1 per cent. Alberta's output reached a total of 5,461,027 tons, which is an increase of 14·9 per cent over that of the preceding year. This tonnage was distributed as follows: 41·2 per cent bituminous coal; 10·4 per cent sub-bituminous coal, and 48·4 per cent lignite. The production of coal in the province of British Columbia, which in 1934 reached a total of 1,485,969 tons, decreased 11·8 per cent to a total of 1,329,379 tons. This production is the lowest recorded for the past forty-two years. The Yukon output in 1935 was 835 tons.

Imports of coal into Canada during the year totalled 13,009,098 tons, which is a decrease of 5·8 per cent from the previous year. Anthracite importations consisted of 3,447,638 tons, of which 48·3 per cent was from the United States, 42·3 per cent from Great Britain, 5·9 per cent from Germany, 1·9 per cent from Belgium, and 1·6 per cent from French Indo-China. Bituminous coal importations amounted to 9,556,214 tons, made up of 9,175,185 tons from the United States, 380,645 tons from Great Britain, 285 tons from Norway, 55 tons from Esthonia, 43 tons from Alaska, and one ton from Poland.

The total amount of coal made available for consumption during the year was 26,455,284 tons, as against 27,317,515 tons for 1934.

There was a slight decrease in the amount of Canadian coal moved under Federal Government assistance; it is estimated that 2,124,748 tons were moved in this way in 1935, as against 2,368,803 tons in 1934. Under these subventions, within certain limits the difference between the laid-down cost of Canadian coal and imported coal is paid by the Dominion Government.

The total amount of coal moved under subvention since 1928, when this assistance came into effect, is 9,310,584 tons, at a cost to the government of $8,801,856. The administration of this government assistance is carried out by the Dominion Fuel Board.

The government assistance to the coal-mining industry, as rendered by the Fuel Research Laboratories of the Mines Branch, Department of Mines, was continued during the year. Research work on coal preparation, storage properties and general characteristics of coals, was carried out with a view to the increased use of these coals in Canadian plants to displace the imported product. Research work on the amenability of various Canadian coals to hydrogenation was studied throughout the year, in order that, when such a process becomes economic, information will be available as to the suitability of various Canadian coals available for this purpose.

With continued assistance in the transportation of Canadian coal from the mine to the market, it is hoped that an improvement in the coal-mining situation, which was evidenced in 1935, will be continued in 1936.

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48. COKE IN 1935

Producing Localities

Coke was produced from coal in coke and gas plants, in all provinces except Prince Edward Island and Saskatchewan. Petroleum coke was produced at petroleum refineries in the provinces of Nova Scotia, Quebec, Ontario, Manitoba, Saskatchewan, and Alberta.

Important Developments and Prospective Producing Localities

The new coke crushing and screening plant installed by the Dominion Steel and Coal Corporation during 1934, was remodelled in 1935. Considerable quantities of coke from the ovens of this company were sold throughout the Maritime Provinces for use as a domestic fuel.

The Montreal Coke and Manufacturing Company continued to use, during 1935, Nova Scotia coal to the extent of 35 per cent of the total coal charged to the ovens.

The coke ovens at Hamilton, including the Hamilton By-Product Coke Ovens Limited and the Steel Company of Canada, and those at Sault Ste. Marie, continued to market increased quantities of coke for use as domestic fuel.

The Winnipeg Electric Company, which formerly used United States coal exclusively, is still continuing to use 100 per cent Canadian coal—(Michel colliery)—in its ovens at Winnipeg.

The International Coal and Coke Company at Coleman, Alberta, continued to supply the requirements of the smelter at Trail, B.C., with Beehive oven coke.

Experimental work was conducted both at the Fuel Research Laboratories and at Coleman, to determine the quality of coke best suited for smelter requirements.

The coke and gas plant of the British Columbia Electric Power and Gas Company, Limited, at Vancouver, B.C., continued to supply an improved quality of coke for domestic use in Vancouver. A foreign market was also developed to the extent of approximately 20,000 tons, most of which was marketed in Seattle.

Production and Trade

The total production of coke from coal in 1935 is reported as 2,282,411 tons, as compared with 2,243,420 tons in 1934. The production in the eastern provinces (Nova Scotia, New Brunswick, and Quebec) in 1935 was 730,307 tons as compared to 654,305 tons in 1934. In Ontario, the 1935 production was 1,361,553 tons as compared with a production of 1,388,709 tons for the previous year, while in Manitoba, Alberta, and British Columbia, the 1935 production was 190,551 tons as against 200,406 for 1934.

In addition to the coke made from coal the amount of petroleum coke produced at oil refineries was 61,760 tons of which 52,467 tons valued at $200,512 was sold and 9,293 tons valued at $57,961 was consumed by the refineries. The total production of this type of coke is not available for 1935, but imports are recorded as 81,915 tons and exports as 16,941 tons.

The production of coke from bituminous coal in Canadian ovens increased approximately by 1·7 per cent over that of 1934. The amount of Canadian coal used for this purpose was 993,704 tons, an increase of approximately 1·4 per cent. Exports of coke in 1935 amounted to 20,649 tons as against 7,396 tons in 1934.

Canada's imports of coke in 1935 were 523,858 tons as compared with 930,221 tons in 1934. Further improvement in the coke situation is looked for in 1936, owing to the increased demand for this product in the domestic market.

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DEPARTMENT OF MINES, OTTAWA,
FEBRUARY 22, 1936. (R.A.S.)

49. NATURAL GAS IN 1935

Producing Localities

Alberta continues to be the leading producing area in Canada, contributing over 65 per cent of the total Canadian production. The Alberta production comes chiefly from the Turner Valley field, where the wet gas is stripped of its naphtha content and, after scrubbing, is piped into Calgary, Lethbridge, and intermediary points. The Viking field supplies Edmonton and district; the Medicine Hat field, the oldest in the province, supplies the industrial and domestic requirements of Medicine Hat and Redcliff. A small field at Brooks supplies that town with its requirements, and the town of Wainwright is supplied with gas from two wells in the Fabyan field, 7 miles distant.

In Ontario the chief gas fields are located in Essex, Kent, Norfolk, Haldimand, Lambton, and Welland counties. The Kent or Tilbury field has been the most important and lies mainly in Tilbury East township, but extends into the adjacent townships of Romney and Raleigh.

In New Brunswick the Stoney Creek field, a small gas field near Moncton, supplies that city with natural gas for domestic and industrial purposes; the gas is also piped into Hillsborough.

Important Developments and Prospective Producing Localities

In New Brunswick there were no important developments. The company which controls and is developing the Stoney Creek field carries out systematic explorations and drillings during the non-winter months in order to maintain its supply and continue the life of the field.

No commercial gas fields have as yet been located in the province of Quebec. Exploratory drilling during the last few years has struck gas in several wells on both sides of the St. Lawrence between Montreal and Quebec, but not in sufficient quantity to be considered commercial.

In Ontario there are over 2,800 producing wells in the various fields of the province. Over 90 per cent of the wells drilled are owned by small independent producing companies, who drill under contract to sell their output to a distributing company. Extensive drilling in of new gas supplies has more than overcome the shortage threatened in Ontario in 1933. Geological surveys undertaken in the summer of 1935 in the natural gas area of southwest Ontario indicate that there is little likelihood of the towns and cities of that area suffering from a shortage for several decades to come.

In Saskatchewan during 1935, the Lloydminster gas field was further extended by the bringing in of two more commercial wells just south of the town. One of these wells was brought in during July with a flow of 42,500 M cubic feet and another came in during September with a flow of over 8,000 M cubic feet. Both wells are capped for the present. A third well was being drilled in the vicinity, while a short distance to the south of these commercial wells another company was engaged in drilling its third well in the hope of extending the present producing area to the south. The first commercial well in the Lloydminster field was brought in during 1934, and is located about one mile north of the town and is at present supplying the town's requirements of natural gas. The present drilling has in view the supplying of gas to North Battleford, Saskatoon, and intermediate points. Near Kakwa, 25 miles to the south of Hudson Bay Junction, seven tests were drilled to shallow depths, and a small show of gas was obtained in four at a depth of approximately 285 feet. Tests were being drilled on one new location in the Vera-Unity area. South of Prince Albert, near Domremy, a test well had a showing of gas at shallow depth, while at Riverhurst a new deep test was started. A second well was being drilled in the Simpson area.

In Alberta, southern Turner Valley was again the scene of considerable drilling activity, while in northern Turner Valley three wells were drilling, one of which came in during April and proved to be the largest well in the Valley at present. The Alberta Government announced towards the close of the year that they would not at present bring into effect the revision of quotas for output of wells in Turner Valley. Previously the total had been set at approximately 176,000 M cubic feet per day. The regulations, however, still limit the gas flow to 40 per cent of the well's potential output. During 1935, a third absorption plant in Turner Valley came into operation and the erection of a fourth, in the extreme south end, was started towards the close of the year. Test wells were being drilled during 1935 at or near the following points: Aldersyde, Hunter Valley (west of Olds), New Valley, Pekisko, Vermilion, Comrey, Del Bonita, Twin River, Lundbreck, Pincher Creek, and Waterton lakes. Several of these tests had showings of gas or oil or both, the most promising being the wells at Aldersyde and Del Bonita.

In British Columbia, drilling was continued at the well in the Sage Creek-Flathead district in the southeast corner of the province and near the Alberta boundary. Further drilling was also done at the test well located southeast of Ladner, near Boundary Bay, and 18 miles directly south of Vancouver.

Production and Trade

The chief production in Canada during 1935 came, as in former years, from Alberta, where the Turner Valley accounts for the bulk of production. The Alberta production totalled 15,700,000 M cubic feet, while Ontario, which came second, had a production of 7,800,000 M cubic feet. Saskatchewan and New Brunswick, which followed, had productions of 75,558 M cubic feet, and 615,454 M cubic feet respectively, while Manitoba's relatively small production came from six small privately owned, non-commercial wells. The total production for Canada in 1935, which totalled 24,191,612 M cubic feet, showed little change from last year's figure of 23,162,324 M cubic feet.

A small amount of mixed gas (natural and artificial) is imported each year in Ontario from the United States and is used at border points for cooking, heating, and illuminating. The importation in 1935 amounted to 106,401 M cubic feet.

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50. PETROLEUM IN 1935

Producing Localities

Alberta is the leading producing province in Canada. The chief product is naphtha which is derived from the wet gas of the Turner Valley field. Light crude oil also is obtained from Turner Valley and Red Coulee fields, while heavy crude is produced in the Wainwright and Skiff fields.

Ontario's chief oil field is the Petrolia-Oil Springs area, which has been in production since 1861. The Bothwell, Mosa, and Dawn township fields are also important producers. Most of the wells in Ontario have to be pumped to obtain production.

In New Brunswick, the producing area is confined to the Stoney Creek field, about 9 miles southeast of Moncton. The New Brunswick production is relatively small, compared to the Alberta and Ontario figures, but remains fairly constant from year to year. The crude oil is treated in a small topping plant at Weldon, and gasoline and fuel oil produced.

The two wells in the Fort Norman field, Northwest Territories, which had been re-opened in 1932, to supply fuel oil and gasoline for mining operations in the Great Bear Lake field, were again operated together with a small topping plant during the summer season.

In Manitoba, Saskatchewan, and British Columbia, several wells have been drilled that have given small quantities of oil, but no commercial production has as yet been obtained.

Important Developments and Prospective Producing Localities

In Alberta eighteen wells were testing structures in various parts of the province. In the southern part of the province a well in the Del Bonita field, near the Montana border, had a good strike of a sweet crude oil of 38°Bé. gravity towards the close of the year and was being tested for commercial production, after treatment with acid started the oil to flow. At the Aldersyde well, southeast of Turner Valley, a showing of a high gravity green crude free from sulphur was made, and the well is being deepened. This well had previously yielded shows of clear white naphtha in upper horizons. The Alberta Government announced that it will rebate royalties on oil from any discovery well that opens up a previously unproved area. Encouragement is also given to small operators by the reduction of the minimum area from 160 to 40 acres. In the north Turner Valley field a well was brought in during April that proved to be the largest in the whole field at present, and two new wells were started in its vicinity. Seven new wells were brought in as producers in the south end of the field during 1935, while several others were close to production. The producing area has been extended as far south as Section 21, township 18. During 1935 the British American Oil Co., Ltd. acquired the production from three wells in the south end, and arranged for financing the drilling of a new well and the completion of several other wells, and will take any production from them. The company also, in December, 1935, started erecting an absorption plant in the extreme south end of the field.

In Saskatchewan, in the Hudson Bay Junction area, the test, which in 1934 had obtained showings of bituminous material at 590 feet, was deepened to a depth of 1,085 feet.

In British Columbia, the test well being drilled in the Sage Creek-Flathead Valley area, reached a depth of 4,800 feet and further showings of crude oil as well as gas were reported.

Refinery construction and expansion continued in 1935. In the east, three new refineries were proposed for construction in the Montreal area, at Pointe-aux-Trembles, and preliminary work has been started on one of them. The refinery at Petrolia, Ontario, was modernized, and a new cracking plant added, doubling the capacity. In Saskatchewan, during 1935, new refineries were completed and put into operation at Eston, Regina, Yorkton, and Melfort. In Alberta, a small refinery was erected in the Skiff field, while in British Columbia, a large refinery was being built by the Standard Oil Company of California at Burnaby near Vancouver, which will use California crude oil and is expected to be in operation by the spring of 1936. A third absorption plant in the Turner Valley went into operation during 1935, while a fourth is now under construction, and will use a process involving a number of innovations. The advances in processes of extraction of recent years, particularly in the cracking process, have enabled a much greater extraction of gasoline to be made from the crude oil. The most recent development, polymerization, enables the refiner to obtain from the gases released in the cracking operation which were formerly burned, a high grade anti-knock gasoline, which can be mixed with the cracked product to improve its quality and octane rating.

Production and Trade

The total Canadian production without regard to the specific gravities and grade of oil produced is reported as 1,429,386 barrels valued at $3,476,730; in the previous year the production was 1,410,895 barrels valued at $3,449,162. The bulk of the production, as in previous years, came from Alberta, whose output was practically the same as in 1934. Ontario showed an increase of 13,656 barrels, while New Brunswick production was slightly higher than for 1934. Exports and imports being varied in character are shown in the following table:—

Exports:		
Oil, petroleum, crude..	897 gal.	$ 132
Oil, coal and kerosene, refined..	806,760 gal.	99,783
Oil, gasoline and naphtha..	3,357,902 gal.	413,469
Oil, mineral, n.o.p.	9,501,823 gal.	385,118
Wax, mineral..	5,829 cwt.	26,022
Total..		$ 924,524
Imports:		
Petroleum..	1,157,984,991 gal.	$33,934,073
Kerosene, fuel and illuminating oil.. ..	50,634,161 gal.	1,737,563
Lubricating oil..	13,251,270 gal.	2,646,325
Gasoline and other oils..	71,135,433 gal.	4,784,800
Asphaltum and other petroleum products.		989,765
Total..		$44,092,526

Industry and trade throughout Canada showed an improvement during 1935, and the consumption of gasoline showed an increase over the previous year. The production and sale of automobiles in Canada also increased, adding to the consumption of gasoline and oil products. Railroads are using more oil-driven locomotives, and the use of the Diesel engine in ocean-going boats and in mining and farming operations is increasing. The use of oil for home heating shows a slight increase and with the gradual return to normal conditions the demand for oil and its products will still further expand.

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Canada, mines branch reports.

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