CANADA

DEPARTMENT OF MINES

HON. W. A. GORDON, MINISTER; CHARLES CAMSELL, DEPUTY MINISTER

MINES BRANCH

JOHN MCLEISH, DIRECTOR

The Canadian Mineral Industry in 1934

Reviews by the Staff of the Mineral Resources Division

No. 760

OTTAWA
J. O. PATENAUDE
PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
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97477—1½

ALUMINIUM IN 1934

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. 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.

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. 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 more extensive use of the metal in sheet form on passenger boats for bulkheads and cabin construction is planned 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.

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 1934 over the previous year, but in both Canada and the United States there has been a moderate decline; the increased demand for the metal during the year resulted in the liquidation of stocks held over from previous years, and it was not necessary for the producers to expand their production. In 1934 the Canadian production is reported (by the United States Bureau of Mines) as being 17,086 short tons, which may be contrasted with a production of 17,809 short tons in 1933. 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 1934 were valued at $8,007,642, which may be contrasted with the valuation of $6,301,974 in the previous year. Canada also imports many varieties of products manufactured from aluminium; these were valued at $3,362,428 in 1934 and $2,813,388 in 1933. It is interesting to note that in 1934 United States import data record the importation of 112,827 pounds of aluminium scrap from Canada.

ISSUED BY THE MINES BRANCH,
DEPARTMENT OF MINES, OTTAWA,
MARCH, 1935. (A.W.G.W.)

ANTIMONY IN 1934

Ores Mined and Producing Localities

The Consolidated Mining & Smelting Company produce some impure antimony as a by-product in connection with their 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 ores or refined antimony have 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 1934 there were imported 626,854 pounds valued at $32,796; during the previous year only 85,999 pounds valued at $6,629 were imported.

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

The price of antimony in 1934 averaged 8·901 cents a pound, as against 6·528 cents in 1933. The monthly average price gradually increased from a minimum in January of 7·198 cents to 9·361 cents in October, 12·239 cents in November, and 13·730 cents in December. Heavy buying in Europe was responsible for the rapid rise during the latter part of 1934.

While 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 world's production of antimony in 1932 (1933 and 1934 not yet available), as published by the U. S. Bureau of Mines, amounted to 17,000 metric tons, as compared with 31,600 metric tons in 1929, the highest figure of production since the War years.

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DEPARTMENT OF MINES, OTTAWA,
MARCH, 1935. (A.B.)

BERYLLIUM AND BERYL IN 1934

Ores Mined and Producing Localities

Nil.

Prospective Producing Localities

Beryl, a silicate of aluminium and beryllium containing up to 14 per cent of beryllium oxide (equivalent to 5·4 per cent of beryllium), is the only commercial source of the element. Its occurrence is confined to granite pegmatite dykes, a type of rock of wide distribution throughout the world; but only comparatively rarely in such dykes is the beryl content sufficiently high to enable them to be worked for this mineral alone.

A little work was done by Renfrew Minerals, Ltd., on the old Sullivan or Caldwell property in Lyndoch township, Ontario, but operations were stopped before any production was attained. This is probably the most promising beryl occurrence so far recorded in Canada, but requires considerably more work before its commercial importance can be appraised. Intermittent mining has been done upon it since 1926, with a total of about 5 tons of beryl crystals recovered, and surface indications point to the dyke probably extending for several miles. Its beryl content, however, appears to be mainly localized in pockety aggregations of limited surface extent, in which the beryl occurs as individual crystals up to 6 inches in diameter, more or less thickly disseminated in massive feldspar or quartz. The crystals are easily separable by cobbing from the matrix, and associated minerals of possible value include rose quartz, amazonite feldspar, and columbite.

In southeastern Manitoba, beryl has been found to occur in a number of the pegmatites of the Pointe-du-Bois region, where there has been considerable prospecting in recent years, chiefly for lithium minerals. The beryl occurs as crystals, often of fair size, usually scattered rather sparsely through the rock, but sometimes concentrated in local shoots of limited extent. There has been no attempt at production as yet, though small amounts have been recovered from feldspar mining operations. Some of the beryl is white or golden in colour, and a little has been sold for cutting and polishing as gems. The more important occurrences include the Huron claim, adjoining the old Silver Leaf lithium property; the K claim, on the Winnipeg river, 3 miles above Pointe-du Bois; the Grace group, near Greer lake; and the Buck claim, at Bernic lake.

Production and Trade

Canada is not as yet a commercial producer of beryl. Considerable by-product beryl is recovered (chiefly in the United States) from dykes worked for lithium minerals, mica, feldspar, etc., and such by-product mineral has in the past constituted the chief supply. Increased demand, consequent on the success recorded in the useful application of beryllium metal in the commercial alloy field and the overcoming of difficulties in

producing the metal at a low enough cost to make its use attractive to industry, may eventually lead to straight mining for beryl. For the immediate present, however, stocks on hand and known reserves are held to constitute an adequate supply for the relatively restricted market that exists.

One of the chief sources of beryl is the United States, where the mineral is obtained mainly as a by-product of mining operations for feldspar, mica, and lithium minerals. Important amounts are thus produced in South Dakota, and in some of the New England States Occurrences of probable commercial extent have also been reported from several of the western States, notably Colorado and Idaho. The mineral is known to occur in a number of other countries, including India, South Africa, Brazil, Madagascar, Scandinavia, France, Portugal, Spain, and Russia. India, alone, produced 281 tons in 1932 and 324 tons in 1933, the material being shipped to Germany and the United States: these shipments probably represent the largest officially reported output of beryl on record in any country, and indicate that India may prove one of the most important sources of the mineral. No statistics on the world production of beryl exist, but it is believed there is a small, intermittent output in various of the countries listed above.

Beryl prices are not commonly quoted in the open market and sales are usually made under individual contract. The price trend in the United States has been downward in the last few years, there having been a drop from around $60 a short ton for mineral carrying a minimum of 10 per cent BeO, to $35, f.o.b. mines, in 1933-34.

Beryllium is one of the newer rare metals to have become important in the metallurgical field. Its chief application is for the production of special alloys, chiefly of copper, iron, and nickel, upon the properties of which extensive research has been conducted in recent years, notably in Germany, Great Britain, and the United States. Development of commercial production methods for the pure metal encountered many difficulties, but has now resulted in a material drop in the formerly prohibitive prices. Most of the beryllium produced is sold in the form of master alloys with either copper, iron, or nickel, the first-named being by far the most important. A recent development is a reduction in the Be content of the beryllium-copper master alloy: formerly standard at 12·5 per cent, this has now been reduced to 3·5 per cent. The current price of beryllium metal, sold in 3·5 per cent Be master alloy form, is $25 a pound for lots of 250 pounds and over of contained beryllium.

In addition to its use in the above products, research has been proceeding in Great Britain on the non-tarnishing properties imparted to silver by the addition of small amounts of beryllium.

A considerable range of beryllium chemicals is now on the market, including sulphate, acetate, nitrate, chloride, and fluoride. The oxide, either in the natural or pre-shrunk form, is finding employment in the refractories field and for electrical insulation, it having one of the highest melting points of any ceramic material.

ISSUED BY THE MINES BRANCH,
DEPARTMENT OF MINES, OTTAWA,
MARCH, 1935. (H.S.S.)

BISMUTH IN 1934

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 being 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 Refining Company, of Deloro, from the treatment of the silver-cobalt-nickel-arsenical ores of Cobalt and adjoining areas, obtain an impure bismuth and also 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 Smelting Company of Canada completed, in the latter part of 1928, a plant for the electrolytic treatment of bismuth residues obtained from the electrolytic treatment of lead bullion.

Production and Trade

The Canadian production of bismuth in 1934 was 253,644 pounds valued at $301,215; the previous year only 78,303 pounds valued at $81,526 were produced. No separate records of exports or imports of bismuth or bismuth salts are available.

Most of the bismuth is used to manufacture pharmaceutical products; a small proportion is used in the making of so-called fusible or low-melting alloys. As the consumption of bismuth is still relatively small and the uses limited in number, any slight fluctuation in production would have a noticeable effect on the price of this commodity.

The price of bismuth at New York in ton lots remained fixed at $1.30 a pound from January to June, at $1.20 from June to November, and at $1.10 for November and December. For many years the United States price has been maintained a little below the European parity, plus duty.

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DEPARTMENT OF MINES, OTTAWA,
MARCH, 1935. (A.B.)

CADMIUM IN 1934

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 of the Consolidated Mining & Smelting Company, at Tadanac, British Columbia, first started production early in 1928 and has been treating the residues from the zinc refinery.

The zinc refinery of the Hudson Bay Mining & Smelting Company, at Flinflon, northern Manitoba, which started operating in the latter part of 1930, has been producing small quantities of cadmium residues in the form of so-called cadmium precipitate, which is being stocked for future treatment.

Production and Trade

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

The Canadian production in 1934 was valued at $91,019; in 1933 the value was $78,733. Canadian production of cadmium is believed to be exported chiefly to Europe, with small amounts to the Orient.

The possibilities of increased world production of cadmium are great, but the market is rather restricted. During the last few years the market has been more buoyant, owing to the fact that the use of this metal for plating metal for rust-proofing has developed rapidly. It is also used in the manufacture of various alloys, and salts of cadmium find application in the arts, medicine, dyeing, etc. It is anticipated that cadmium will be used extensively in the production of bearing alloys for the motor industry. New alloys that are being introduced are a cadmium-silver-copper bearing, and a cadmium-nickel bearing alloy. Cadmium is marketed mainly in metallic form 99·5 per cent pure and better, and as a sulphide.

The price has been characterized in past years by some remarkable fluctuations but remained fixed at 55 cents per pound during the last four years. The American product is protected by a duty of 15 cents per pound.

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DEPARTMENT OF MINES, OTTAWA,
MARCH, 1935. (A.B.)

COBALT IN 1934

Ores Mined and Producing Localities

All the cobalt that has been produced in Canada has come from Cobalt, Gowganda, and South Lorrain in northern Ontario. At first, it was all obtained as a by-product of silver production; a certain amount of ore is now mined chiefly or solely for its cobalt content.

Final recovery of the cobalt in commercial form is done in part in Canada and in part abroad. The only cobalt-recovery plant now operating in Canada is that of the Deloro Smelting and Refining Company, Ltd., at Deloro, Ontario, which produces cobalt metal, oxides, and salts.

The nickel-copper ores of Sudbury, Ontario, also carry minute quantities of cobalt, but this, so far as known, is not recovered separately.

Prospective Producing Localities

In 1932, test shipments of some 69 tons of cobalt ore were made from deposits of unknown but probably small extent, 40 miles north of Minaki, in Ontario. Nothing, however, appears to have been done on them since.

Production and Trade

The Canadian production in 1934 was 588,566 pounds, valued at $589,933; the previous year's record shows a production of 466,702 pounds, valued at $597,752. The exports were valued at $614,364 in 1934, and at $552,450 in 1933; the quantities exported are not recorded; no imports were reported separately.

Cobalt production in 1934 showed an increase of 26·1 per cent over that of 1933, much of the output resulting from the efforts of lessees and small operators working on the old silver mines at Cobalt. Under suitable contracts guaranteeing a remunerative price, output could no doubt be increased considerably. As it is, most of the producers—having little capital—cannot afford to hold stocks of ore for a favourable market. Also, a further increase in the price of silver might lead to the re-opening of some of the old silver mines and incidentally, to increased production of cobalt, but there is nothing to indicate that cobalt will regain its old importance in the list of Canadian-produced metals.

The published price of cobalt metal, viz., $2.50 a pound—the same as in 1933—remained constant throughout the year, though a somewhat keener demand for cobalt ores was reported.

The Belgian Congo, where cobalt is found in association with copper, is now the world's chief producer. Some output also is reported from Australia, Northern Rhodesia, French Morocco, etc.

ISSUED BY THE MINES BRANCH,
DEPARTMENT OF MINES, OTTAWA,
MARCH, 1935. (A.H.A.R.)

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COPPER IN 1934

Ores Mined and Producing Localities

British Columbia produces low-grade copper ores which require concentrating before smelting; concentrates are either exported as such or are 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 concentrates are 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 concentrates, and zinc-bearing concentrates; one company exports copper concentrates; 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 operations at 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 concentrates being shipped to Tacoma, Washington, and the zinc concentrates to Japan; operations at Anyox continued normal throughout the year, but it is anticipated that operations will be discontinued permanently in the very near future. In Manitoba the Flin Flon was in steady operation, while the Sherritt-Gordon remained inactive. In Ontario copper is now being mined at the rate of more than 200,000,000 pounds per year incidental to the production of nickel now required in diversified industrial markets throughout the world—the International Nickel Company have started at the Creighton mine the sinking of a new 8-compartment shaft (the largest in Canada), which will be extended to the 4,000-foot horizon, also a new underground shaft from the 2,400-foot level of the Frood mine; the Falconbridge has also been sinking a new 5-compartment shaft, located 2,500 feet east of the present main shaft, with a depth of 1,500 feet as the objective; the Cuniptau, a new copper-nickel property, situated near Temagami, has been under development and is expected to start producing early in 1935. In Quebec, the Noranda mine has been operated at normal rate throughout the year, and surface work was started in December on the new No. 5 shaft; the Aldermac mine resumed operations early in the year, shipping copper concentrates to the Noranda smelter and exporting pyrites concentrates to the United States; the Eustis mine, in southern Quebec, was also in regular operation, exporting its copper concentrates to the United States.

97477—2

In British Columbia the Anyox smelter maintained capacity production, the blister copper being exported for treatment at Laurel Hill, N. Y. There has been no copper smelter operations at Trail for the last few years. In Manitoba the smelter of the Hudson Bay Mining and Smelting Company continued at full capacity, the blister copper produced being shipped to the Montreal East refinery. In Ontario four new converters were put in operation in December at the Copper Cliff smelter, giving now a battery of twelve converters, thus adding to the possible output and resulting in smoother smelting operations and lower costs; the Coniston smelter was operated regularly, treating mainly Creighton ore for the production of monel metal matte; the Falconbridge smelter was operated at full capacity. In Quebec, the Noranda smelter was also in regular operation throughout the year.

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 increased capacities although somewhat below their annual nominal capacities of 120,000 tons and 75,000 tons, respectively.

Exploration for new properties and development work on prospects remains very restricted owing to the present economic conditions. Nevertheless, one outstanding event during 1934 was the vigorous explorations by Consolidated Mining and Smelting Company of the gold-copper showings on Doré lake, Chibougamau district, about 170 miles west of lake St. John.

Production and Trade

The total Canadian production in 1934 was 364,890,860 pounds, valued at $26,681,069; in 1933 the production was 299,982,448 pounds, valued at $21,634,853.

Exports were:

	Pounds	Dollars
Copper fine in ore, matte, etc.	35,145,200	1,655,936
Copper blister	26,962,200	2,113,200
Copper in ingots, bars, rods, etc.	187,554,000	13,943,724
Copper old and scrap	3,888,200	222,909
Copper in rods, strips, sheets, plates and tubing	57,903,100	4,801,979
Copper wire and cable	.....	323,683
Copper manufactures	.....	252,331
		23,313,762

Imports were:

Copper in bars, rods, blocks, pigs, ingots, tubes, wire and scrap	778,700	90,898
Copper manufactures and compounds	.....	648,391
		739,289

Owing to the special revenue tariff of 4 cents a pound, sales of Canadian refined copper in the United States have ceased since 1933; concentrates shipped to the United States, chiefly from British Columbia, but also from Quebec, were treated in transit, 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.

According to the Engineering and Mining Journal, New York, the beginning of 1935 finds the world's copper industry, as a unit, statistically in better condition than at the beginning of each of the three previous years. Viewed from the standpoint of consumption, price, and reduction of excessive stocks, there has been a progressive improvement since 1932. Much room for improvement still exists before the industry reaches a "normal" state. In 1934 foreign demand (outside of the United States) for copper, based on deliveries of the refined product, was the highest in history, while the price of the metal abroad was the lowest.

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 1934 approximated 175,000 tons, as against about 120,000 tons in 1932. The increase is attributed mainly to the expansion in house building and the improvement in the transportation and engineering industries. For the future, according to the British Metal Corporation, the main influence on copper consumption in Great Britain seems likely to be the increased use of electricity in the home and at a later date widespread electrification of the railways.

Although world consumption has improved and stocks outside of the United States are relatively small, aggregate world stocks are still rather heavy. The world's production in 1934 is estimated at 1,314,000 tons, as against 994,000 tons in 1932 and 1,735,000 tons in 1930. Canada in 1934 contributed 14 per cent of the total world's production.

The New York price of domestic electrolytic copper averaged 8·428 cents a pound in 1934, as against 7·025 cents in 1933. Due to the 4 cents duty there is a differential of from 2 to $2\frac{1}{2}$ cents a pound between the foreign and the domestic price.

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DEPARTMENT OF MINES, OTTAWA,
MARCH, 1935. (A. B.)

97477—2½

GOLD IN 1934

Ores Mined and Producing Localities

The chief sources of Canada's gold in 1934 were—as for many years in the past—the gold-quartz mines of Porcupine and Kirkland Lake in northern Ontario. Due to a more rapid increase in production in other parts of the Dominion, however, the proportionate amount supplied by these two areas in 1934 was somewhat less than in preceding years.

Nearly all the gold recovered in Ontario, the chief producing province, is from gold-quartz mines, though there is also an important contribution by the nickel-copper mines of the Sudbury district. The output of Quebec, the second largest producing area, is chiefly from the Noranda gold-copper mine, supplemented by an increasingly important amount from a number of gold-quartz mines in the northwestern part of the province. British Columbia's chief producers are gold-quartz mines, though considerable amounts are also recovered from base-metal mines and from placers. Manitoba's output is chiefly from the Flin Flon copper-zinc-gold mine—with increasingly important amounts from gold-quartz mines. That of Saskatchewan is all from that portion of the Flin Flon mine lying inside the Saskatchewan boundary. Yukon's output is practically all placer gold; Alberta's insignificant output entirely so. Nova Scotia's production is all from gold-quartz deposits.

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

Important Developments and Prospective Producing Localities

The search for and development of gold deposits continued with unabated vigour, in all parts of the Dominion in 1934, with the result that some 50 new mills were put into operation during the year. A number of others are under construction, and operations on some of the older mines have been expanded considerably.

Of 22 new mills that are reported to have come into production in Ontario in 1934, ten are credited with a rated capacity for the treatment of 50 tons or over of ore a day. These are: the Young-Davidson, 500 tons; Little Long Lac and Lebel Oro, 200 tons each; McMillan and Northern Empire, 150 tons each; St. Anthony, 125 tons; Matachewan Consolidated and Bidgood, 100 tons each; and Central Patricia and Casey Summit, 50 tons each. In addition, a 200-ton mill on the McKenzie-Red Lake and one of 150 tons at the Pickle Crow were under construction at the end of the year.

In British Columbia the Bralorne mine increased its milling capacity from 225 to 450 tons a day; the Pioneer from 300 to 400 tons; and the Cariboo Gold Quartz from 70 to 100 tons. Also, some 12 new mills are reported as having commenced production, of which the Dentonia with a

rated capacity of 100 tons is treating 140 tons of ore a day. The Yankee Girl has a rated capacity of 100 tons; the Columario, 100 tons; the Kootenay Belle, 65 tons; the Minto, about 60 tons; the Island Mountain and Ymir Consolidated, 50 tons each; and the Wayside, 40 tons. In addition a 150-ton mill is under construction at the Sheep Creek Gold mine; a 100-ton mill at the Meridian mine; and the old Hedley mill has been re-conditioned. It is reported further that the capacity of both the Cariboo Gold Quartz and Island Mountain mills, in the Cariboo district, will probably be doubled in 1935. Placer ouput in 1934 did not differ materially in amount from that of 1933; but two large operations now in progress in the Cariboo district promise to increase production from this source in 1935.

In Quebec four new mills were put in operation in 1934, chief among them being a 100-ton plant on the McWatters mine and one of 50 tons on the Sullivan Consolidated. There was also under construction at the end of 1934: a 200-ton mill on the Lamaque mine; a 150-ton mill on the Canadian Malartic; and a 500-ton cyanide plant to recover the gold in the pyritic residues of the flotation plant at the Noranda mine. At the Beattie mine a cyanide plant was built to recover part of the gold, formerly all shipped in concentrates to smelters. Capacity of the Siscoe mill was increased to 400 tons a day.

In Manitoba, the treatment capacity of the San Antonio mill was increased to 300 tons a day; a 50-ton mill was put in operation on the Island Lake mine; and another of 50-tons capacity on the Diana, formerly the Gem Lake mine. Material for a 150-ton mill, which is expected to be in operation early in the fall of 1935, is being taken in to the God's Lake mine.

Not for many years has there been so much active interest shown in the possibilities of the Nova Scotia goldfields as in 1934, a most gratifying feature of this activity being the entrance into this field of successful operators from Great Britain and from other parts of the Dominion.

Production and Trade

The total gold production of Canada in 1934 is reported as being 2,969,680 ounces, valued at standard rates at $61,388,732; the previous year the production was $2,949,309 ounces valued at $60,967,626. Valued in Canadian funds the output in 1934 was worth $102,453,960 as against $84,350,237 in 1934.

Since there is no immediate prospect that there will be any material drop in the present high price of gold and that, on the contrary, the price may go higher still, unabated activity in and increased production from gold mining is indicated for 1935. Other factors tending to increased volume of production in 1935 are the number of new mills and mill additions that came into operation at various times during 1934, but of which the full effect will not be reflected in production records till 1935; the construction of still other new mills that will come into production in 1935; and the fact that the tendency of some of the larger—older mines—to mill lower grade ore rather than increase volume of output appears to have run its course, for the time being at least. The outlook therefore is that gold production in Canada in 1935 will be a record one—both in volume and value.

ISSUED BY THE MINES BRANCH,
DEPARTMENT OF MINES, OTTAWA,
MARCH, 1935. (A.H.A.R.)

9

IRON IN 1934

Ores Mined and Producing Localities

The three iron-making centres in Canada are:—Sydney, Nova Scotia, on the Atlantic coast, and Hamilton and Sault Ste. Marie in the inland province of Ontario. A merchant furnace making pig iron is also operated intermittently at Port Colborne, Ontario. The Sydney furnaces procure almost all their ore from their own mines at Wabana, Newfoundland, but import also from Europe or North Africa small amounts of special ores for mixing for the production of certain special grades of pig iron. All the United States ore imported is used in the Ontario furnaces which depend entirely on the United States Lake Superior region for their supply.

Production and Trade

The total production of pig iron in Canada in 1934 was 406,995 long tons of which 301,465 was for plant use in making steel, and 105,530 tons were for sale. In the previous year only 176,784 long tons were made for plant use and 50,533 tons for sale, a total of 227,317 long tons.

Imports of iron and its products in 1934 (including iron ore to the value of $977,341) were valued at $93,615,090, of which about $71,000,000 worth was from the United States and $19,000,000 worth was from Great Britain. Exports of iron and its products in 1934 amounted to $37,402,314, of which about $3,000,000 worth went to the United States; about $9,000,000 worth to Great Britain, and the balance to other countries.

Pig iron production in Canada in 1934 showed an increase of about 79 per cent over that in 1933 but Canadian furnaces are still being operated much below their full capacity. Bounties on the production of pig iron from local ore are offered by three Canadian provinces—Ontario, Quebec, and British Columbia—but no domestic ore has been used in Canadian furnaces for a number of years now.

There are no large known bodies of high-grade iron ore in Canada that could be made tributary to present Canadian furnaces. There are, however, two very 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 low-grade 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., have developed some 33,000,000 tons of proved and probable ore consisitng 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.

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DEPARTMENT OF MINES, OTTAWA,
MARCH, 1935. (A.H.A.R.)

10

LEAD IN 1934

Producing Localities

The greater part of the lead ore produced in Canada in 1934 came from the Sullivan silver-lead-zinc mine at Kimberley, B.C., where concentrates are produced that are treated in the lead refinery at Tadanac, near Trail, B.C.

The only other producers were the Monarch silver-lead-zinc mine, near Field, B.C., operated by Base Metals Mining Corporation; and the Keno Hill silver-lead property, in the Mayo area, Yukon Territory, and operated by the Treadwell Yukon Company.

Considerable production has been obtained in the past from numerous silver-lead and silver-lead-zinc mines in the Kootenay district and other parts of British Columbia. Ontario's production was formerly derived from the lead mine at Galetta, Carleton county; Quebec's output was from the Notre-Dame-des-Anges lead-zinc mine in Portneuf county; in Nova Scotia production was obtained from the Stirling copper-lead-zinc property near Stirling in Cape Breton.

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 & Smelting Company were operated throughout the year. Improved metallurgical methods of treatment, introduced in 1931, have increased the recovery of lead. The electrolytic lead refinery at Trail has a capacity of 475 tons of refined lead a day, or 170,000 tons a year.

The Monarch mine, near Field, with important ore reserves and a 300-ton concentrator, resumed operations in the latter part of 1933, and was operated throughout 1934, the lead and zinc concentrates produced being exported to Europe.

There are in British Columbia several promising mines equipped with up-to-date milling plants, which are only awaiting better market conditions to resume operations. There are also properties such as the Reeves-McDonald at Pend d'Oreille river, the Ferguson at Ingenika river, and the Emerald in Sibola area, that have not as yet been brought to the producing stage and which are potential producers.

In Quebec, the Notre-Dame-des-Anges property in Portneuf county was under development, but no production was reported.

The Stirling copper-lead-zinc property in Cape Breton, Nova Scotia, completed in the early summer of 1930 the construction of a new 250-ton concentrator which was in operation only for a short time. The property is still idle.

Production and Trade

The Canadian production in 1934 was 346,270,062 pounds valued at $8,436,524; in the previous year the production was 266,475,191 pounds, valued at $6,372,998. The total imports of lead and lead products were valued at $1,337,320 in 1934, being slightly less than the imports of the previous year, which were valued at $1,473,515. The exports of lead in ore or in pigs was 306,803,800 pounds, valued at $5,747,709; in the previous year the exports were 291,929,400 pounds, valued at $5,190,319.

Despite unfavourable conditions the world's production of lead in 1934 amounted to approximately 1,499,000 tons, as against 1,340,000 tons in 1933 and 1,289,000 tons in 1932, which figures are much below the record-breaking tonnage of 1,935,000 tons in 1929.

Canada contributed 11½ per cent of the world's lead production in 1934. The principal producing countries are, in order of importance, United States, Australia, Mexico, Canada, Germany, and Spain.

While world's production of lead has been gradually increasing from the low figure of 1932, stocks of lead in all forms increased in 1934 by about 20,000 tons, the smallest increase for several years, bringing the total stocks to about 315,000 tons by the end of 1934. On the other hand, there has been a noticeable improvement in consumption. In the United States the principal consumer continues to be the lead pigments industry. The policy of the United States administration with respect to the public utility industry is of the utmost importance for the lead industry as well as for the copper industry. Consumption of lead in the United Kingdom during 1933 and 1934 has been running at a rate much in excess of that for the year 1929. This big increase in demand has been due primarily to the expansion of the building industry in the past two years; it has also benefitted from the notable expansion in the motor industry, and from the demand for cable sheathing; this latter source of consumption is likely to be maintained with the constantly increasing employment of electricity.

The consumption of lead in certain specified Canadian manufacturing industries amounted to 31,600 tons in 1930; 24,300 tons in 1931; and 16,900 tons in 1932.

The average price of pig lead at Montreal in 1934 was 4 cents a pound as against 3·7 cents in 1933. The average price of pig lead at New York was 3·860 cents as against 3·869 cents in 1933.

ISSUED BY THE MINES BRANCH,
DEPARTMENT OF MINES, OTTAWA
MARCH, 1935. (A.B.)

11

MANGANESE IN 1934

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 obtained in small lots mainly from New Ross in Lunenburg county, Loch Lomond in Cape Breton island, and Aylesford, Kings county, all in Nova Scotia; from Dawson Settlement bog and from Turtle Creek, Albert county, and from Markhamville, Kings county, both in New Brunswick.

In British Columbia, a first shipment was made from a bog manganese deposit located near Kaslo, Ainsworth mining division. Shipments have also been made from deposits near Cowichan lake, Vancouver island; these latter shipments are a mixture of secondary oxides, principally pyrolusite, psilomelane, and manganite.

Important Developments and Prospective Producing Localities

No new developments in 1934.

Production and Trade

There is no present record of production of manganese ore in Canada in 1934. The imports during that year of "manganese oxide" were 30,953 tons valued at $234,236. The total imports into Canada of "manganese oxide" from 1928 to 1933 inclusive were 363,959 tons valued at $3,666,527.

The manganese ore imported into Canada comes mainly from the Gold Coast, West Africa, and is principally used in the making of ferro-manganese. Notwithstanding the duty of nearly 2 cents per pound of metallic manganese in ferro-manganese of a grade of 30 per cent or more, most of the Canadian ferro-manganese is exported to the United States and these exports in 1933 were 60 per cent of the total imports of ferro-manganese 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 3,500,000 metric tons in 1930 to 1,300,000 metric tons in 1932. A noticeable improvement started during the last half of 1933 and continued throughout 1934.

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

The price of manganese ore at North Atlantic ports for 46 to 48 per cent manganese, Brazilian, per unit, was 19 cents in January, 22 cents in March, and 24 cents from October to the end of December, giving an average of 22·25 cents per unit for the whole of 1934; for chemical grades 80 per cent MnO_2, the price throughout the year was $55 to $60 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.

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DEPARTMENT OF MINES, OTTAWA,
MARCH, 1935. (A.B.)

MOLYBDENUM IN 1934

Ores Mined and Producing Localities

Two operators, both in Ontario, produced a total of about two tons of molybdenite concentrates, but no shipments were made other than a few hundred pounds for experimental purposes.

Important Developments and Prospective Producing Localities

Ontario. The Phoenix Molybdenite Corporation, Toronto, completed the erection of the concentrator on their property near Ashdad in Bagot township, Renfrew county. Approximately 200 tons of ore obtained from a new pit north of the old workings were treated. Slightly over one and a half tons of concentrates were produced, which are at present in storage on the property.

Some exploration work was conducted on the Chisholm property near Enterprise, Sheffield township, Lennox and Addington county. A shaft 27 feet deep is said to have struck ore at the bottom and some fair grade molybdenite was exposed in a small pit 300 feet to the south. In the fall of 1933 slight additions were made to the old mill erected in 1917. In January 1934 a few hundred pounds of concentrates, obtained from ore mined from the old workings near the mill, were sent out as samples. The plant was closed down for most of the year.

Several pits were sunk by A. V. Dukes on a molybdenite impregnated quartz vein, north of lake Abitibi, near Mace on the Canadian National railway, Steele township, Cochrane district.

Quebec. On the Bain property in Masham township, about 36 miles northwest of Ottawa, prospecting work was carried on intermittently under H. H. Claudet, Ottawa.

Some prospecting work was done on a molybdenite-bearing zone occurring alongside the railway track west of Portneuf station.

British Columbia. Tunnelling operations by the Martel Gold Mines, Limited, Vancouver, disclosed some promising molybdenite ore on the property located in the Venables valley, 15 miles south of Ashcroft.

Production and Trade

Canada imported 35,187 pounds of calcium molybdate in 1934 for use in the manufacture of steel alloys, valued at $15,586; in the previous year the imports were 7,082 pounds valued at $3,414.

The United States now produces about 75 per cent of the world's total molybdenum. The Climax Molybdenum Co. at Climax, Colorado, and the Molybdenum Corporation of America, near Questa, New Mexico, were, as in former years, the principal producers. In 1934 the total United States output consisted of 1,312,400 short tons of molybdenite ore which yielded 8,723 tons of concentrates averaging 88·98 per cent molybdenum sulphide;

and 26,600 tons of wulfenite ore (mainly from Arizona mines) which yielded 396 tons of concentrates averaging 9·12 per cent molybdenum trioxide. The total concentrates shipped in 1934 contained 4,688 tons of metallic molybdenum with an estimated value of $6,502,000 compared with the previous record year of 2,880 tons ($4,316,000), a tonnage increase of about 65 per cent.

Mexico maintains a considerable output, mainly from Cananea. The output in 1934 of high-grade concentrates contained about 850 tons of metallic molybdenum, against 73 tons in the concentrates produced in 1933. The mill at the Knaben mine, Norway's principal producer, was burnt down in February, 1934, but was re-built and operations resumed after six months, the output being 292 short tons of concentrates, a decrease of 40 per cent below that of 1933. Five other molybdenite companies were active in Norway during the year. A 100-ton mill was erected in 1933 by the Le Molybdène Company of Paris, France, in the Azegour district, Morocco. They produced in that year 130 tons of concentrates and the output has since been continuous. Production was maintained from the old workings of the Deepwater and Glenn Innes molybdenite properties in New South Wales, Australia.

Molybdenum is chiefly used in combination with other alloying metals, particularly nickel, chromium, and vanadium. In spite, however, of the low ebb of steel production, the use of molybdenum alloys is continually growing. In conjunction with copper, this metal is now attracting attention as corrosion-resisting steels. In a high-speed cutting tungsten steel, some of the tungsten has recently been replaced by molybdenum, resulting in certain advantages. 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.

Molybdenum is introduced into steel either as calcium molybdate or as ferro-molybdenum, particularly the former.

The price of 85 per cent molybdenite concentrates is nominally 42 cents per pound of contained molybdenum sulphide at New York. The duty on ore or concentrates into the United States is 35 cents per pound on the metallic molybdenum contained therein.

Activity in molybdenite prospecting and mining increased appreciably throughout the world during the year. There were a considerable number of enquiries for Canadian material, but these, however, call for regular tonnages of a consistent grade of concentrates 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.

ISSUED BY THE MINES BRANCH,
DEPARTMENT OF MINES, OTTAWA,
MARCH, 1935. (V.L.E.-W.)

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NICKEL IN 1934

Ores Mined and Producing Localities

Nickel produced in Canada is obtained almost entirely from the nickel-copper ores of the Sudbury district in Ontario; a small amount is also recovered as a by-product from the silver-cobalt-nickel ores of the Cobalt district. The known reserves of nickel ore around Sudbury are by far the largest in the world, being estimated at well over 200,000,000 tons, carrying perhaps, on the average, about 3 per cent nickel and 2 per cent copper though the grade varies greatly in different mines and in different parts of the same mine. The largest individual ore-body, that of the Frood, has been only partly explored as yet, but over 125,000,000 tons of ore are already indicated.

Important Developments and Prospective Producing Localities

The International Nickel Company have four mines equipped for large-scale operations, the Frood, Creighton, Garson, and Levack. A new 8-compartment shaft (the largest in Canada) is being sunk to a depth of 4,000 feet at the Creighton mine, and at the Frood mine a new underground shaft is being put down from the 2,400-foot level, the concentrator treating over 6,000 tons of ores a day. Four new converters were put in operation in December at the Copper Cliff smelter, giving now a battery of twelve converters, thus adding to the possible output and resulting in smoother smelting operations and lower costs; the Coniston smelter was operated regularly, treating mainly Creighton ore, which is high in nickel, for the production of monel metal; the nickel refinery at Port Colborne was in regular operation throughout the year.

The Falconbridge has also been sinking a new 5-compartment shaft, located 2,500 feet east of the present main shaft and with a depth of 1,500 feet as the objective; the Falconbridge 250-ton mill, two-unit sintering plant, and smelter were operated at full capacity, and the nickel-copper matte produced was shipped to the Company's refinery in Norway.

The Cuniptau, a new copper-nickel property situated near Timagami, Ont., has been under development and has erected a 60-ton smelter for the production of copper-nickel matte; starting production early in 1935.

The B. C. Nickel Company continued in 1934 the extensive exploration and development program started in the latter part of 1933, for proving up the nickel-bearing pyrrhotite deposits situated on Emory creek, near Hope, B.C.

Production and Trade

The total Canadian production in 1934 was 128,687,340 pounds valued at $32,139,425; during the previous year the production was 83,264,652 pounds valued at $20,130,480. The remarkable increase in nickel sales

that began in the first half of 1933, was further augmented during 1934, showing an increase in production of about 56 per cent over that of 1932 and 18 per cent over that of 1929, the previous high year. Nickel products of all kinds, including alloys, were imported to the value of $1,161,352, as against a value of $1,051,913 in the previous year. Exports were recorded as being 118,152,100 pounds valued at $29,913,230 in 1934; the exports in the previous year were 88,082,100 pounds valued at $22,795,968.

The nickel industry in supplying a demand both world-wide and industrially diversified has directly benefitted from the general improvement in the world industry, which has been noticeable since the latter part of 1933.

The following remarks are abstracted from the review of the Nickel Industry by R. C. Stanley, President of the International Nickel Company:—

Sales in the Old World (United Kingdom, Western Europe, Russia, and Japan) for the first ten months of 1934 have equalled those for any similar period in previous history; they include a 40 per cent increase in monel metal, and 30 per cent increase in the production of various alloys of high nickel content: the United Kingdom was the outstanding purchaser, and Australia became during the year a substantial buyer of fabricated nickel steels.

In the New World (Canada and the United States) increased volume in 1934 has resulted more from the better demand stimulated in established markets by general business improvement, than from the opening up of new industrial fields for the application of nickel.

In the United States, the world's largest single consumer, the year has witnessed two developments of potential importance to the nickel industry; the Government's campaign to stimulate home modernization, and the determination by the Government and business leaders to work together in revising the durable goods' industries.

The world's consumption of nickel in all forms in 1934 was about 64,000 tons, or 33 per cent higher than in 1933 when it approximated 48,000 tons; the consumption in 1929 was reported as 68,000 tons.

The nominal price of nickel in New York in 1934, as reported by the Engineering and Mining Journal, was 35 cents a pound throughout the year.

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DEPARTMENT OF MINES, OTTAWA,
MARCH, 1935. (A.B.)

14

PLATINUM GROUP METALS IN 1934

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.

Important Developments and Prospective Producing Localities

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 1934 was 116,230 ounces, valued at $4,490,763; in 1933 it was 24,786 ounces, valued at $857,590. The production of palladium and the other associated metals of the group was 83,932 ounces, valued at $1,699,282 in 1934; the preceding year it was recorded as being 31,009 ounces, valued at $645,044. The imports of platinum products in 1934 were valued at $64,023, as against a valuation of $73,974 in 1933. Exports in 1933 were valued at $5,198,691, as against $1,174,004 in 1933; export records do not record the metals of the platinum group present in exported copper-nickel mattes.

It is probable that for the first time Canada has become the leader in the production of platinum, thus displacing Russia, which country had previously held first place; Canada also leads the world as the largest producer of palladium. This condition has resulted from the heavy demands for nickel. The next important producers of metals of the platinum group are South Africa and Colombia.

The price of refined platinum opened the year 1934 at $38 an ounce. This price gradually dropped to a minimum of $35 in November. The average price for the year was $36·465 as against $30·993 in 1933, and $36·455 in 1932.

In 1931 an agreement between the world's largest producers resulted in the formation of Consolidated Platinum, Ltd., which company was to buy and re-sell all new platinum and promote the use of platinum through

intensive research and a market development program, but the company became inactive shortly after its formation, and all of the platinum metals produced from the Sudbury ores are, therefore, 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 is estimated by Baker & Company (Metal & Mineral Markets, Jan. 17, 1935), at about 200,000 ounces, compared with 175,000 ounces in 1933, and 75,000 ounces in 1932. A feature of developments in the industry in 1934 of the platinum metals was the steady growth in the use of palladium, and prospects for continued steady increase in consumption are said to be favourable. The uses of platinum have also increased, and rhodium plating has made remarkable progress.

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MARCH, 1935. (A.B.)

RADIUM AND URANIUM IN 1934

Ores Mined and Producing Localities

The Eldorado property at LaBine point, Great Bear lake, continued to be the only important producer of radium ore. During the year the company's refinery at Port Hope, Ontario, received a total of 83 tons of picked ore and concentrates. Sampling at the refinery has indicated an inclusive radium content for this shipment of 8 to 9 grammes of radium, or an average of approximately 1 gramme to 10 tons.

Mining development during the year consisted chiefly in sinking on the main, or No. 2, vein, in order to prove up ore reserves. A vertical shaft, or winze, has been carried to a depth of 250 feet from the 1,200-foot section of the tunnel drift, with stations cut at 125 feet and 250 feet. From these, levels will be run along the vein, and cross-cuts made to tap the other known parallel leads. The company reports that the work done has already proved sufficient ore above 250 feet to keep the refinery running at capacity for five years. In addition, prospecting from surface was conducted on the No. 3 vein by diamond drilling, and on the northerly extension of the No. 2 vein in the gulch at the head of LaBine bay by a shallow shaft.

The 50-ton concentrator was in operation throughout the year, making both pitchblende and silver concentrates. A total of 750 tons of freight was shipped in to the property in 1934, including the necessary machinery to increase the mill capacity to 75 tons.

Important Developments and Prospective Producing Localities

Northwest Territories. Other companies doing development work at Great Bear lake probably mined small amounts of pitchblende during the year, but there were no records of any shipments. The principal properties known to possess pitchblende showings are those of Consolidated Mining and Smelting Company, on ground adjoining the Eldorado mine, and of B.E.A.R. (Bear Exploration and Radium), at Contact lake 10 miles south of LaBine point.

Reports were current during the year of important pitchblende discoveries at Hottah and Beaverlodge lakes, about 100 miles south of LaBine point, and on the direct flying route between Fort Rae, on Great Slave lake and Great Bear lake. Considerable prospecting of the area developed, and a few tons of pitchblende were secured from various groups of claims. Sample shipments of the ores sent to the Ore Dressing Laboratories of the Mines Branch for test showed them to consist of pitchblende distributed through a gangue of hematite iron and quartz. Some of the samples proved to be high-grade, with contents of U_3O_8 up to 50 per cent. The possible commercial importance of the occurrences remains to be determined, since the pitchblende is stated to occur in rather erratic, pockety fashion, with no proven persistent veins.

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Ontario. Minor amounts of surface prospecting for uraninite continued to be done in the Wilberforce area, on ground adjacent to the now idle property of International Radium and Resources, in Cardiff township, but no active mining was conducted.

Canada Radium Mines continued its program of shaft-sinking on its property at Cheddar, south of Wilberforce, and reported having reached a depth of 375 feet at the end of the year. This work has been done with the object of ultimately running cross-cuts from the shaft to develop a series of parallel veins, said to carry radioactive minerals. Nearer information is lacking regarding the nature of the minerals claimed to be present, or of the amount found.

Production and Trade

The production in 1934 was 79 tons of shipping ore; in the previous two years the total production was 74 tons. This ore came wholly from the property of Eldorado Gold Mines, Limited, at LaBine point, Great Bear lake, N.W.T. The production consisted of 63 tons of table concentrates, 7 tons of picked high-grade ore, and 7 tons of low-grade flotation concentrates, all shipped out by water toward the end of the year; the remaining two tons were sent out in small lots by airplane.

Radium production was 3·1 grammes in 1934 and 3·0 grammes in 1933; the uranium salts produced in 1934 totalled 27,000 pounds, and in 1933, 34,940 pounds; the uranium products made were chiefly orange and yellow sodium uranate, and small amounts of black uranium oxide and uranium nitrate. Most of the output of uranium salts has been exported to England. In addition, 31,000 ounces of silver have been recovered from the pitchblende treated. Most of the 1934 production was derived from ore landed at the plant in 1933, since, due to transportation delays, the 1934 shipment did not reach Port Hope till November.

The Port Hope refinery was in operation throughout the year. The plant has a capacity of one-half ton of pitchblende per day, which it is planned to step up to one ton as soon as an adequate supply of raw material is assured. A large addition was made to the plant towards the end of the year in the shape of a separate new building for the exclusive production of uranium salts.

Radium salts are imported for medical and scientific purposes; the annual values of these imports for the last five years have been: 1930, $46,012; 1931, $207,735; 1932, $45,108; 1933, $8,374; 1934, $211,140.

The Eldorado Company reports the various difficulties encountered in the initial stages of development of its enterprise to have been satisfactorily overcome, and a Canadian radium and uranium industry to be now established on a firm basis. Agencies have been established in England and the United States for the sale both of radium and of uranium salts, and the company feels assured of a ready market for all it can produce.

ISSUED BY THE MINES BRANCH,
DEPARTMENT OF MINES, OTTAWA,
MARCH, 1935. (H.S.S.)

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SELENIUM IN 1934

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 quantities 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 slimes of the Canadian Copper Refiners, Ltd., at Montreal East, Quebec. This latter company have been storing the residues for future treatment; they began production in November, 1934.

Production and Trade

There being only two producers in Canada statistical data on the production is not released; while 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. Further research as to new uses will, no doubt, create a wider market 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 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; 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 $1.80 to $2.00 per pound at New York has prevailed for several years.

ISSUED BY THE MINES BRANCH,
DEPARTMENT OF MINES, OTTAWA,
MARCH, 1935. (A.W.G.W.)

SILVER IN 1934

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 as a by-product from the treatment of the gold and the copper ores of the Rouyn and adjoining areas in western Quebec; in Ontario, the production is mostly obtained from the silver-cobalt-nickel-arsenical ores of Cobalt, Gowganda, and South Lorrain; from the gold ores of Porcupine, Kirkland Lake, and a few other less important areas, and as a by-product 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 as a by-product from the treatment of silver-lead-zinc ores 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 ores of Britannia mine, near Vancouver, and of the Granby Company's mines near Anyox. The Yukon production is derived from the argentiferous lead ores 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 reserves. The ores mined in 1934 had the following approximate silver content: siliceous gold ores 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 470,252 ounces as against 471,419 ounces in 1933.

The silver mines of Cobalt and adjoining areas in Ontario have in recent years been showing a gradual falling off in production, accentuated under the unprecedented low price of silver, but the recent noticeable improvement in the price of silver has stimulated production particularly by leasers 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 5,320,820 ounces as against 4,535,680 ounces in 1933.

The copper-zinc ores of Flin Flon and Sherritt-Gordon mines in northern Manitoba contain small quantities of gold and silver, which are recovered in the refining at Montreal East, Que., of the blister copper produced from these ores. The Flin Flon property was operated at full capacity throughout the year. The 900-ton concentrator of the Sherritt-

Gordon remained idle in 1934. Small quantities of silver are also obtained from the treatment of gold ores in eastern Manitoba. The Manitoba silver production in 1934 amounted to 810,725 ounces, as against 1,101,578 ounces in 1933.

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 others. The British Columbia production was 8,749,289 ounces as against 6,737,057 ounces in 1933, and 11,825,930 ounces in 1930.

The curtailment of operations at the copper mines during the past three 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 1934, mainly from the Mayo district high-grade silver-lead ores, amounted to 553,587 ounces, as against 2,227,476 ounces in 1933. Unless new discoveries are made the improvement in the price of silver is more permanent, a further noticeable decline in production is in the offing.

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 up by more intensive exploration and development. The Eldorado 75-ton concentrator started operations early in December 1933. The mill is equipped to produce pitchblende as well as silver concentrates. The Bear Exploration and Radium, Ltd., performed some development work during 1934 and have announced their intention of erecting a small concentrator in 1935. Consolidated Mining & Smelting Company have been doing exploration work during the year, and made a few shipments of high grade ore to Trail. The White Eagle Company and a few others carried on exploration work during the year. The expectation that the Great Bear Lake district will in the near future take prominence as an important silver producer has not as yet materialized.

Production and Trade

The total Canadian production of silver in 1934 was 16,441,361 fine ounces, valued at $7,803,218; in 1933 the production was 15,187,950 ounces, valued at $5,746,027. The exports were 1,745,152 ounces of silver in ores and concentrates valued at $714,444 and 10,664,334 ounces of silver bullion valued at $5,648,134; in addition silver coins to the value of $645,915 were exported. The imports included unmanufactured bullion to the value of $2,193,201, and sterling and other silver coins to the value of $67,425.

The world's production of silver, as given by the American Bureau of Metal Statistics, was 180,022,000 ounces against 164,700,000 ounces in 1933 and 262,241,000 in 1929.

The price of silver in New York in 1934 averaged 47·973 cents a fine ounce as against 34·727 cents in 1933 and 28·700 cents in 1931. From an average of 44·188 cents in January, the price gradually improved to a maximum average of 54·390 cents in December.

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 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.

As the gold stocks of the United States at the end of 1934 were about $8,230,000,000, the total silver requirement is estimated at 1,433,000,000 ounces. The amount purchased and requisitioned during 1934 is estimated at 317,400,000 ounces leaving approximately 1,120,000,000 ounces to be purchased on the basis of the present gold holding. The President under the terms of the Gold Reserve Act, 1934, is empowered to reduce the weight of the standard silver dollar equally with the weight of the gold dollar, but such a step would largely nullify the purposes of the Silver Purchase Act.

The largest supply of silver coming into sight in 1934 was the exports from China. The Nanking Government has imposed an export duty and taken various other measures in the latter part of the year, to safeguard China's monetary stock of silver. In the opinion of Handy and Harman, the well-known New York silver dealers, the silver market will show great steadiness so long as the United States remains a buyer and prices should tend to advance. Silver interests throughout the world are speculating as to the ultimate level which silver may reach on account of the enormous potential demand created by the action of the United States Government.

Announcement was made in August, 1934, of the formation of the "Montreal Silver Exchange" to provide a market for spot and future contracts in silver. The name was changed in October to the "Canadian Commodity Exchange, Inc.," being a consolidation of the Montreal and Toronto interests, and trading started in the latter part of October. 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, and conditional on similar undertakings by Australia, the United States, Mexico, and Peru, covering an aggregate of 35,000,000 fine ounces annually.

ISSUED BY THE MINES BRANCH,
DEPARTMENT OF MINES, OTTAWA,
MARCH, 1935. (A.B.)

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TELLURIUM IN 1934

Producing Localities

Tellurium is an essential constituent of several minerals, and has also been found native; none of these minerals have been found in quantities large enough to constitute commercial ores. 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 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 limited 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 November. 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

There was a small production in Canada in 1934, but the quantity is not separately recorded; 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. Very finely powdered tellurium is also 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.

ISSUED BY THE MINES BRANCH,
DEPARTMENT OF MINES, OTTAWA,
MARCH, 1935. (A.W.G.W.)

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ZINC IN 1934

Ores Mined and Producing Localities

Nearly three quarters of the zinc produced in Canada during 1934 came from the Sullivan silver-lead-zinc mine near Kimberley, B.C. The balance of the production was obtained from the Flin Flon copper-zinc mine at Flin Flon, Manitoba, the Base Metals (old Monarch) silver-lead-zinc mine near Field, B.C., and the Britannia copper mine on Howe Sound, B.C.

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 & 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 the addition of a new slag-fuming plant which recovers the zinc formerly lost in the slag from the lead furnaces, and also by the large addition known as the "zinc oxide leaching plant" completed in 1930 wherein are treated the mixed oxides of lead and zinc. These additions have increased the capacity of the works to a total of about 400 tons of zinc a day, or 145,000 tons a year.

The Base Metals (Monarch) mine, near Field, which was equipped in 1929 with a modern 300-ton mill, and which had been idle for two years, resumed operations in August, 1933, and is now producing at the monthly rate of about 1,200 tons of lead and 1,700 tons of zinc, in the form of concentrates which are exported to Wales. Development work at this property had increased considerably the known ore reserves. The mines of the Slocan district were nearly all idle throughout the year.

In Manitoba, the Hudson Bay Mining & Smelting Company completed their concentrator and the zinc refinery in the fall of 1930 and the first shipment of refined zinc was made early in December of that year. The plants have been operated at full capacity during the last four years, and are producing at the annual rate of about 22,000 tons of zinc.

The Sherritt-Gordon had its new concentrator in operation in the spring of 1931, but operations were confined as much as possible to producing copper concentrates, until the price of zinc shows some improvement. The mine and mill were closed down in May 1932. Operations will be resumed at this property, when market conditions show sufficient improvement.

In Ontario, the Treadwell Yukon Company, Ltd., which had carried on for several years extensive development at the Errington mine, in the Sudbury basin, ceased all operations in December 1931. The concentrator was closed down in November 1930 due to the collapse of the metal market, and also to the fact that the pilot mill had answered its purpose.

In Quebec, the Amulet concentrator was in operation for a few months in 1930, and has since been idle. The Amulet property was amalgamated with the adjoining Waite-Ackerman-Montgomery property late in 1933,

and both properties, now known as the Waite-Amulet Mines, Ltd., are awaiting more favourable market conditions before resuming operations.

The Normetal (Abana) was re-opened and extensive development carried on, resulting in further increasing the known reserves of copper-zinc ore.

In Nova Scotia, the Stirling new mill completed in 1930 operated only a short time and has been idle since the fall of 1930.

The proposed construction of zinc refineries in eastern Canada by the Consolidated Mining & Smelting Company and by Noranda Mines, Ltd., has been postponed indefinitely due to the low price and surplus world's production of zinc at the present time. These proposed plants would provide the Sherritt-Gordon, Errington, Noranda, Waite-Amulet, Abana, and others with a market for their zinc concentrates.

Production and Trade

The Canadian production of metallic zinc in 1934 was 298,579,581 pounds valued at $9,087,568; the previous year's production was 199,131,984 pounds valued at $6,393,132. The imports of zinc products of all kinds, including oxide and chemicals, were valued at $1,506,221, as against $1,273,431 in the previous year; the exports, chiefly in the form of spelter were valued at $7,694,067 in 1934, and at $5,173,014 in 1933.

It has been estimated that the world's production of zinc for 1934 approximated 1,272,000 tons as against 1,103,500 tons in 1933, 873,800 tons in 1932, and 1,620,290 tons in 1929.

Canada in 1934 became the third largest producer of slab zinc and is now contributing over 10 per cent of the total and displacing Poland. 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 1934 was 4·059 cents per pound as against 4·488 cents in 1933. The St. Louis price was 4·158 cents as against 4·029 cents in 1933.

ISSUED BY THE MINES BRANCH,
DEPARTMENT OF MINES, OTTAWA,
MARCH, 1935. (A.B.)

ARSENIOUS OXIDE IN 1934

Producing Localities

All the white arsenic (As_2O_3) at present produced in Canada is made by the Deloro Smelting and Refining Company, Ltd., at Deloro, Ontario, who also manufacture arsenical insecticides, from arsenical silver-cobalt-nickel ores from Cobalt and surrounding districts in northern Ontario.

Important Developments and Prospective Producing Localities

Gold-bearing arsenical concentrates are produced at the Beattie gold mine in Quebec, and at the Bralorne gold mine in British Columbia, the product in both cases being shipped to the United States. It is understood that arsenic as well as gold is recovered from this material by the smelters to whom they are shipped, but that no payment is made for the arsenic.

Arsenopyrite deposits associated with more or less gold are also known to occur in a number of other localities in the provinces of Ontario, British Columbia, and Nova Scotia; and some of these that are now being worked for gold—for example the McMillan mine near Sudbury in Ontario, or the Hedley in British Columbia—could no doubt furnish considerable amounts of arsenic also should sufficient demand arise.

Production and Trade

The Canadian production of arsenious oxide in 1934 was valued at $56,652, being only $118 more than in the previous year. The exports were 1,291,900 pounds valued at $45,012; in contrast the exports in 1933 were 934,400 pounds valued at $33,778. Our imports of arsenious oxide were 1,637,382 pounds valued at $41,688; imports of other compounds of arsenic were valued at $51,386.

Actual and potential world production of by-product arsenic is much in excess of world demand, consequently the price is low and practically no mining is done primarily for the winning of arsenic. At the Boliden mine in Sweden, for instance, thousands of tons of arsenic, necessarily produced in the winning of gold and copper, are being stored awaiting means for its innocuous disposal. It has been stated that the Boliden mine alone is capable of supplying all the world's demands for arsenic.

The chief uses of arsenic are in the manufacture of insecticides, weed-killers, cattle dips, and glass. Minor uses are in pigments, antiseptics, preservatives, and medicines.

ISSUED BY THE MINES BRANCH,
DEPARTMENT OF MINES, OTTAWA,
MARCH, 1935. (A.H.A.R.)

21

ASBESTOS IN 1934

Producing Localities

Canadian asbestos, which is of the chrysotile or serpentine variety, is all obtained from the Eastern Townships, Quebec. Fibrous minerals similar to asbestos 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.

Important Developments and Prospective Producing Localities

No new asbestos properties were reported as opening during the year. Explorations and development on the properties of the operating companies have disclosed reserves of ore sufficient for many years to come. Last year the fact that the Turner and Newall Company had acquired a substantial interest in a large company operating in the productive area was noted. In November (1934) public announcement was made by the Quebec Asbestos Corporation, Limited, operating at East Broughton, that they had secured a site in Lennoxville, Quebec, for the location of a manufacturing plant; previously most of the production from the property at East Broughton was exported.

Production and Trade

The production in 1934 is reported to have been 155,980 tons, valued at $4,936,326; this may be contrasted with the production of 158,367 tons in 1933, valued at $5,211,177. In 1929 the production was 286,324 tons.

Most of the Canadian chrysotile asbestos fibre is exported; in 1934 the recorded exports were 83,267 tons of asbestos, valued at $4,029,191; 74,977 tons of asbestos sand and waste, valued at $1,100,305; and manufactures of asbestos, valued at $140,826.

The only imports recorded are 83 tons of asbestos packing valued at $64,713; brake and clutch linings valued at $218,050; other products not specifically designated, valued at $408,020.

During the last five years the asbestos industry has passed through a drastic period of decreasing sales and lowering prices, with corresponding declines in production and in exports; the economic situation in the United States, the chief market for Canadian asbestos products, was the leading factor in causing this decline; the position was further aggravated by the economic situation in Europe and by the development of new and keen competition with foreign producers, chiefly in Africa and Russia. Apparently the end of this long decline 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 continued throughout the year 1934, although the total production was slightly less than in the

previous year. 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 $450 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 $65 a ton for high-grade shingle-stock.

ISSUED BY THE MINES BRANCH,
DEPARTMENT OF MINES, OTTAWA,
MARCH, 1935. A.W.G.W.)

22

BENTONITE IN 1934

Producing Localities

The term bentonite is used to designate clays of varying mineral composition, but alike in possessing certain physical properties and characteristics that distinguish them from clays of ordinary type. Bentonite clays of the more highly colloidal type are conspicuous for their gel-like nature and excessive stickiness when wetted, and their ability to form fairly stable dispersions or suspensions in water. Many of them have high adsorptive (bleaching) power, and this property may often be enhanced by acid treatment (so-called "activation"). They are believed to have been formed by the alteration of the glassy material of volcanic dust, which accounts for their wide distribution, sometimes in thick beds, in western sedimentary rocks.

Clays of bentonitic type are known in many sections of the Prairie Provinces and British Columbia. There has been little attempt at active production, however, and most of the material mined has come from two deposits, one at Princeton, B.C., and the other near Edson, Alberta. The Princeton clay is shipped to a Vancouver plant for grinding, and has been utilized chiefly in oil and gasoline refining; as an admixture in concrete to lower the viscosity of the mix; and in foundry work. That from Edson has been employed by an Edmonton concern in the manufacture of a varied range of cosmetic products.

Important Developments and Prospective Producing Localities

The plant of Claynett Ltd., moved from Edmonton to Edson in 1933, was in intermittent operation during 1934, but was reported to have closed down at the end of the year. The proposed installation of an activation plant to treat the Princeton clay did not materialize.

Some work was done during the year on an occurrence of bentonite near Morden, Man., and a trial shipment made to Edson. The material is reported to possess unusually high bleaching power, even in the crude state, and to be fully equal in this respect to the best imported clays.

It is believed that adequate deposits of suitable clays exist in Canada to satisfy domestic requirements, but so far little interest has been shown in developing a home industry. The Saskatchewan government, however, has recently investigated the bentonite resources of the province, and the National Research Council, at Ottawa, has undertaken an investigation of a number of Canadian clays to determine their bleaching quality, both in the crude and activated state.

Production and Trade

The recorded Canadian production in 1934 was 63 tons valued at $1,578; in the previous year the production was 55 tons valued at $1,363.

There are no separate records either of export or of import of bentonite. There is, however, a considerable importation of clays of bentonitic type, in either the untreated or activated state, for use in the refining of mineral oils and gasoline, as well as for the clarifying of vegetable oils, packing-house products, etc., and for the reclaiming of crank-case oil. The source of such so-called "bleaching clays" is the United States; they are sold under various trade names, and hence it is often difficult to determine their correct classification.

The foundry and other trades, also, doubtless use considerable amounts of bentonite.

Its unique properties have led to the employment of bentonite for a variety of uses, chief among which are for the refining of mineral oils and gasoline; clarifying of vegetable oils and packing-house products; in core-washes, facings and for the re-generation of spent moulding sands, in foundry work; in the ceramic industry; and in concrete mixes.

The chief world source of bentonite is the United States, where, in certain of the western states, notably Wyoming, South Dakota, Utah, and California, a number of companies are actively engaged in producing the material, both for domestic consumption and export. A considerable proportion of the clay produced is marketed in the acid-treated, or activated, form, for bleaching purposes.

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DEPARTMENT OF MINES, OTTAWA,
MARCH, 1935. (H.S.S.)

BITUMINOUS SANDS IN 1934

Producing Localities

Deposits of bituminous sand occur along Athabaska river between the 23rd and the 26th base lines, in the northern part of the province of Alberta; exposures may be seen along both sides of the Athabaska river and of 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 and the production recorded herein has arisen out of their activities. 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 are now making 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 the year one firm produced about 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 sand for experimental studies. No production of raw sands for paving purposes is reported. In the previous year 466 tons of bituminous sand were mined and shipped.

ISSUED BY THE MINES BRANCH,
DEPARTMENT OF MINES, OTTAWA,
MARCH, 1935. (S.C.E.)

CEMENT IN 1934

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

The Canadian production of Portland cement in 1934 was 3,783,226 barrels valued at $5,667,946; in the previous year the production was 3,007,432 barrels valued at $4,536,935. Exports were 70,046 barrels valued at $55,181, as against 52,531 barrels valued at $47,369 in the previous year. The imports of Portland cement and hydraulic lime were 14,341 barrels valued at $45,548; in addition certain other unspecified cement products valued at $4,167, were imported.

ISSUED BY THE MINES BRANCH,
DEPARTMENT OF MINES, OTTAWA,
MARCH, 1935. (A.B.)

25

CHROMITE IN 1934

Ores Mined and Producing Localities

The principal chromite deposits are situated in the Coleraine district, Quebec, and are regarded as capable of producing large quantities of low-grade ore were there any market demand for the type of ore produced in the area; there has been virtually no production from them since 1923. During 1934, some test shipments of chromite were made from Ontario deposits at Obonga Lake—26 miles south of Collins station on the Canadian National railway—and, according to articles appearing in the press, regular shipments will commence early in 1935, the ore to be hauled from the mine to the railway by tractor over a newly-cut winter road.

Important Developments and Prospective Producing Localities

The most import event in connection with chromite in Canada in 1934 was the announcement in the fall of the year by Chromium Mining and Smelting Corporation, Ltd.—an Ontario incorporation—that diamond-drilling on their property at Obonga Lake had indicated at least 225,000 tons of 17 per cent chromium ore; that in due course a 75-ton concentrating mill would be erected at the mine; and that meantime selected high-grade ore would be shipped to Niagara Falls, N.Y., to be converted into ferro-chrome in an electric furnace leased from the General Abrasive Co. Early in 1935 the further announcement was made that the first metal had been made in the Niagara Falls furnace and that regular shipments of ore from the mine to the smelter would, for the present, be about 66 tons a day.

Considerable prospecting work was done in 1929, 1930, and 1931, on chromite deposits on Scottie creek, about 20 miles north of Ashcroft, British Columbia, in the hope of delimiting ore bodies of present commercial grade. Trial shipments of some 150 tons of ore were made from here in 1929. Occasional small shipments of chromite have also been made in the past from Cascade near Grand Forks, British Columbia. No special activity in connection with any of these British Columbia properties has been reported in 1934.

Production and Trades

Imports of chromium ore into Canada are not separately recorded. Chromium products imported in 1934, however, included 2,374,311 pounds of sodium bichromate valued at $138,313; 139,865 pounds of potassium bichromate valued at $11,684; chrome firebrick to the value of $39,184; nickel-chromium bars and rods containing more than 10 per cent chromium, 48,413 pounds valued at $45,114; and chromium metal and tungsten metal, and scrap alloys of these two metals, 26,222 pounds valued at $16,461. There is no recorded exportation of chromium or its products.

Due to the development of high-grade alloy steels containing chromium, such as the stainless steels, to the growing use of chromite refractories, and expanding use of chromium-plating in the automobile industry, world demand for chromite has increased greatly of late years, the greatest part of the present supply coming from Rhodesia, the remainder chiefly from New Caledonia, India, Cuba, Greece, Yugo-Slavia, Russia, and South Africa. Success for the new Canadian industry will depend on its ability to compete in world markets with these high-grade sources of supply.

ISSUED BY THE MINES BRANCH,
DEPARTMENT OF MINES, OTTAWA,
MARCH, 1935. (A.H.A.R.)

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DIATOMITE IN 1934

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. It also mined, calcined and shipped four or five car lots of diatomite from its deposits at Little River, Digby neck, Nova Scotia. About two car lots were shipped from stock to Toronto by the Diatomite Products, Limited, Martin Siding, Muskoka, Ontario. A few tons were also shipped from the Dominion Diatomite Company's plant near Novar, Muskoka. The B. C. Refractories, Limited, continued mining on a small scale from their deposits at Quesnel, British Columbia, and two or three tons were shipped by W. H. Hind from Burnaby Lake, Vancouver, 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. The decrease in production below that of 1933 was due to shipments being held up several months through wage strikes in the plants of its principal customers. Most of its material was excavated from Gard pond and some from Rhude, Lockerby, and Conky ponds. The two latter of this series of deposits, situated south of New Annan, Nova Scotia, were operated for the first time. The crude diatomite peat is calcined at a small mill close to the ponds and is then pulverized and air-separated at a small plant at Tatamagouche Station. The finished product is largely used for battery box manufacture, for which purpose the diatomite is exceptionally well suited. Satisfactory results are said to have been achieved from experiments in the preparation of filter-aid products.

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, the Diatomite Products, Ltd., who in 1933 completed the erection of a large treatment plant at Martin Siding, was idle during the year, but shipped one or two car lots of calcined material from stock. The Dominion Diatomite Company periodically operated the plant near Novar and calcined a few tons of the diatomite peat mined during the previous year; some of the products being used for silver polish by the Glisenclene Products Company, Toronto. Late in the year the Novar plant and property was optioned by the Diatomite Refiners Company, 45 Richmond St. West, Toronto, Ontario.

The B. C. Refractories, Ltd., continued operations on a small scale and shipped a few tons to their Vancouver plant from Quesnel, in the Cariboo district, British Columbia, where the largest known diatomite deposits in the Dominion occur. Prospecting in the same region was carried out by Mr. Geo. H. Turner, and some of the crude diatomite was used locally in Quesnel for insulation purposes. A small experimental plant was erected in Vancouver by Mr. W. H. Hind to treat the diatomite mud from Burnaby Lake, situated close to Vancouver City. A small amount of the calcined material was sold locally for use in silver polish.

Production and Trade

The Canadian production in 1934 was 1,370 tons, valued at $54,750; in the previous year the production was 1,789 tons, valued at $36,648. There are no export records available, but from private information it is known that about 90 per cent of the production was exported; Canadian sales amounted to only 135 tons. The imports in 1934 were approximately 2,500 tons, all from California, U.S.A.

Although slightly more Canadian diatomite was used in the home industries during the year, there was a slacking off in demand, reflected in the lowering of the imports. Less was used in the major consuming industries such as sugar filtration and insulation, though the demand continued as formerly for diatomite as a filter-aid in cleaning establishments, and for battery boxes. A few companies in the vicinity of Toronto are manufacturing diatomite insulation bricks and stove pads, mainly using up, however, the diatomite imported or purchased in 1933.

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 highest quality and properly prepared diatomite can now be successfully marketed on a scale sufficiently large to warrant the operations 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 $110 to $140 per 1,000, according to grade and density.

In the United States there were during the year about 15 producers and, although most of the smaller (of under 1,000 tons each) showed a decrease, the increase by the three major producers indicates a general increase over 1933, the total sales for the year being estimated at about 110,000 short tons.

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FELDSPAR IN 1934

Producing Localities

Canada produces mostly feldspar 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.

While the bulk of the production of feldspar has always come from a few larger mines, a considerable 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.

Most of the 1934 output came from mines in the Buckingham district, in Quebec, which has long been one of the main productive areas. This district also furnishes all of the dental feldspar produced. The Ontario production came principally from the Perth district, Lanark county; the Hybla district, in Hastings county, once an important centre of production, now furnishes only a very small output. For the first time, Manitoba registered a production of feldspar for the ceramic trade, previous output having been low-grade material for stucco purposes. The material produced came from the Pointe du Bois district, in the southeastern part of the province, and was shipped to a grinding mill at Warroad, in Minnesota.

Important Developments and Prospective Producing Localities

The entry of Manitoba into the list of producing provinces was the only important development during the year. Feldspar appears to be widely distributed in the Pointe du Bois area, and provided adequate shipping facilities can be arranged, the region should be in a good position to supply increasing tonnages for export. Most of the 1934 production was derived from a mine at Greer lake, on the south side of Winnipeg river, 14 miles above Pointe du Bois, to which point shipment was made by scow. A few hundred tons were also mined from a deposit 3 miles above Pointe du Bois, on the north side of the river.

There were no further developments during the year in connection with the extensive nepheline syenite occurrences in Methuen township, Peterborough county, Ontario, to which reference was made in last year's review. Experimental tests have shown that this rock can be satisfactorily cleaned of its iron-bearing impurities by magnetic means, and the resulting product has been pronounced an eminently satisfactory substitute for straight feldspar for various ceramic uses, particularly for the glass trade. Distance from rail is stated to be a serious obstacle to com-

mercial production on an important scale. Search for other deposits of similar rock, better situated with respect to transportation, was conducted during the year, and important occurrences were located near Bancroft, in Hastings county. From these, a trial carload shipment was made to the United States, for magnetic concentration tests, and if these prove satisfactory, commercial production is contemplated.

Production and Trade

The Canadian production in 1934 was 17,335 tons valued at $140,975; in the previous year the production was 10,568 tons valued at $105,117. Exports were 10,532 tons valued at $65,158, being almost three times as great as in the previous year, when 3,596 tons, valued at $23,076, were exported. The imports were 1,039 tons valued at $15,245; in 1933 they were 560 tons valued at $7,970. It may be noted that in addition to feldspar imported in the ground state by domestic potteries, a small tonnage of crude high-soda spar is also brought in from the United States by grinders for use in blending in with the Canadian product to meet special requirements.

The year saw a marked improvement in the demand for feldspar, with a 63 per. cent increase in production over 1933. Prices, however, remained static, and, if anything, showed a tendency downward. This may be attributed to price-cutting made possible by lower production and haulage costs as a result of competition and improved efficiency and control of operations.

Although the bulk of the production in 1933 was for domestic consumption, 1934 saw a notable increase in exports, this being a trend back to the condition ruling in the pre-depression years, when most of the output went to America grinding mills. In Quebec, four mines operated on an important scale and furnished the great bulk of the tonnage; in Ontario, two mines produced practically the whole of the recorded output.

Both the grinding mills, that of Frontenac Floor and Wall Tile Company, at Kingston, Ont., and 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 its Montreal plant.

The price level for No. 1 crude spar averaged around $5 to $5.50 a ton f.o.b. rail or mill, and for ground spar, $16 per ton ex mills.

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FLUORSPAR IN 1934

Producing Localities

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 1934, the small recorded tonnage was all recovered from small surface workings and waste dumps in the Madoc area.

Important Developments and Prospective Producing Localities

None.

Production and Trade

The recorded Canadian production was 150 tons in 1934, valued at $2,100; in the previous year only 73 tons valued at $1,064 were produced. There were no exports. The imports were 7,220 tons valued at $56,628; in the previous year the imports were 2,219 tons, valued at $21,165. In addition 6 tons of hydrofluosilicic acid, valued at $1,370, were imported, as compared with 9 tons, valued at $2,062, in 1933.

The principal use for fluorspar is as a flux in the metallurgical and ceramic industries. About 80 per cent of the production is estimated to be used in basic, open-hearth steel making, so that the condition of the steel industry has an important effect on fluorspar mining. Most of the remainder is consumed in the foundry, glass and enamel trades; in the manufacture of hydrofluoric and hydrofluosilic acids; and in cement plants recovering potassium salts, where it promotes volatilization of the potash.

Prices showed little change over the previous year, quotations for the various industrial grades, as given in American trade journals, being as follows: Domestic, per net ton; 85 per cent calcium fluoride and not over 5 per cent silica, washed gravel, $16; No. 2 lump, $15 to $16; ground, 95 per cent to 98 per cent calcium fluoride and not over 2½ per cent silica, $35. Foreign, per gross ton: 85 per cent calcium fluoride and not over 5 per cent silica, gravel, $21 to $21.50, duty paid Atlantic ports.

Fluorspar entering the United States pays an import duty of $8.40 per long ton.

Fluorspar is a mineral that is fairly widely distributed throughout the world, and important deposits occur in a number of countries. The United States, Germany, Great Britain, France, Italy and Spain are the principal producers. The discovery of large deposits on the Kara sea, in Russia, has recently been reported, from which 6,000 tons are stated to have been mined in 1934.

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GRANITE IN 1934

(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, and for heavy aggregate in large concrete structures. Owing to the heavy curtailment of operations of this nature during the past few years the production of granite for this purpose was seriously affected. The improvement shown in this branch of the industry over 1933 leads one to believe that while the production is still far below the record years, the recovery may be steady.

The province of Quebec furnishes the largest proportion of granite for building purposes, the Stanstead, Scotstown, and St. Sebastien 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 have been forced to close down until such time as business shows a decided improvement. The year under review showed a slight improvement over 1933.

The curbstone and paving block industry has also been extremely quiet throughout the year.

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. Efforts were made during the year to meet the foreign competition by the further development of "black granite" deposits in Nova Scotia in the district southeast of Antigonish. The results of trial samples placed on the market were promising. Another company called Angler Granites, Limited was formed to exploit "black granite" and other types of monumental and building granite being quarried at Angler, Ontario. This company is now ready to supply the trade.

Another interesting development during the year was the further work done on a quarry of grey granite in Manitoba, 100 miles directly east of

Winnipeg on the Winnipeg-Kenora highway. The stone from this quarry is medium to fine-grained, grey, and very uniform in texture, and a number of carloads were shipped to Winnipeg and other centres both east and west, where the blocks were used for monumental dies and bases. The year's operations proved that large size blocks can be obtained.

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. With the heavy falling-off during the past few years of building generally throughout Canada, the demand for dimensioned granite has been low.

Production and Trade

The Canadian production of granite for 1934 was 202,211 tons valued at $771,745; in the previous year the production was 360,398 tons valued at $748,470. Our exports were 1,153 tons valued at $9,766, as against 964 tons valued at $12,997 in the previous year. The imports of granite were valued at $98,134 in 1934 compared with imports valued at $91,730 in 1933.

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.

Any upward turn in the building industry should immediately be 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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GRAPHITE IN 1934

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. Remi 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 the year, producing various grades of refined graphite as well as facings, etc., for the foundry trade. Shipments in 1934 totalled 1,369 tons, being nearly four times the 1933 figure. Of interest is the announcement that Black Donald graphite is now being satisfactorily used in pencils, the higher-grade concentrates 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 Canadian production in 1934 was valued at $71,424; in the previous year the valuation was only $18,367. Exports are reported as being 1,935 tons, valued at $90,129, almost double those of the previous year, 987 tons, valued at $40,115. Graphite imports, including crucibles, were valued at $143,004 in 1934, compared with $100,253 in 1933. No graphite crucibles are manufactured in Canada.

Owing to currency fluctuations and the general disorganization of international trade, graphite quotations at present may mean little or nothing. In general, the market is over-supplied with offerings and many sales are effected by private treaty. There would, however, appear to have been little change in prices over the previous year. Ruling quotations, as given in trade journals, in 1934, were as follows, all f.o.b. New York: Ceylon lump, 6½ to 7½ cents per pound; No. 1 flake, 8 to 17 cents per pound; No. 2 flake, 5½ cents per pound; crude amorphous, $12 to $23 per ton.

97477—5½

World Situation

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.

Owing to improvements in the technique of manufacture, resulting in longer life, and to the growing use of oil-fired and electric furnaces for the melting of metals, the graphite crucible industry now absorbs far less graphite than formerly. A recent estimate shows less than 25 per cent of the total graphite consumed in industry entering into crucible products, whereas some years ago the proportion was estimated at 75 per cent. Lubricants, foundry work, and paints represent the other chief uses.

On account of its finely-divided character, natural low-grade amorphous graphite usually cannot be satisfactorily freed of 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.

Ceylon stands pre-eminent as the principal world source of high-grade crystalline graphite (plumbago). Germany and Madagascar lead in the production of flake graphite, while Korea, Austria, Mexico, and Italy all produce chiefly amorphous graphite. Extensive developments in connection with important graphite discoveries in Russia were announced during the year.

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GRINDSTONES, PULPSTONES, AND SCYTHESTONES IN 1934

Producing Localities

Grindstones. The Read Stone Company, Saekville, N.B., the only producer of these stones, increased their sales 140 per cent over 1933. 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 National Trust Company, Montreal, receiver for the Miramichi Quarry Company, finished and shipped over a 100 tons of pulpstones from Quarryville, N.B. The J. A. and C. H. McDonald Co., Vancouver, increased their pulpstone sales about 100 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 increased 37 per cent over 1933 and are quarried by the Read Stone Co., Stonehaven, and by G. A. Smith, Shediac, N.B.

Important Developments and Prospective Producing Localities

There are no important new developments.

Production and Trade

Canadian grindstones are quoted at $42 per ton, and pulpstones at $66 per ton.

The production of all grades of stones in 1934 was 887 tons valued at $46,478; in the previous year the production was 498 tons valued at $21,919. The exports of these stones in 1934 were valued at $4,947, as against a valuation of $2,840 in the previous year. The imports, which consisted chiefly of pulpstones, were valued at $144,818, as against $79,131 in the previous year.

The large size Canadian grindstones are mainly used for sharpening pulp mill knives, and in the United States are used in the file, machine-knife, granite tool, and shear manufacturing industries. The small stones, of which there was a considerable increase in Canadian sales, 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 since 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. Probably about 125 of these manufactured stones are now in use in Canadian mills.

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GYPSUM IN 1934

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

Important Developments and Prospective Producing Localities

The general upward trend of business in Canada during 1934 was not nearly so marked in the building industry, an industry which usually lags from six months to a year behind any general improvement of business 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 made in 1934 has been definite and gives promise of rapid improvement during 1935.

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 status of the Canadian gypsum industry, since the amount shipped is entirely dependent on the status of the building industry in the United States.

The several large companies operating in Canada carried on under reduced normal production, still maintaining, however, their endeavours to reduce operating costs and improve their products, so that while their sales during the year are still below that of normal years, their financial standing has been well maintained.

A company called Gyproc Products, Ltd., formed in England in 1933, commenced operations during 1934, and is now turning out a full line of gypsum products which are finding a ready market throughout England and Scotland. This company is closely associated with one of the Canadian gypsum companies.

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 marks the first commercial shipments of Canadian gypsum to the Old Country, and the shipments will probably show a large increase during 1935.

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 Canada in 1934 totalled 461,194 tons valued at $864,204; in 1933 it was 382,736 tons valued at $675,822. The exports amount to 355,690 tons valued at $430,039, compared with 287,938 tons valued at $358,084 in 1933. The imports were 742 tons valued at $21,148 in 1934, while in the previous year they amounted to 769 tons valued at $21,520.

The use of gypsum products in the building trades has made rapid strides 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 29·3 per cent in the value of building contracts awarded in Canada during the year as compared with 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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IRON OXIDES (MINERAL PIGMENTS) IN 1934

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 Beaupre, 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 1934. 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.

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 due 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, due to similar reasons, have not been developed. In Saskatchewan there are several known deposits of ochres and iron oxides and in 1934 it was reported a plan was under way toward organization of a company to develop some of these deposits and to construct a plant near Riverhurst, which would employ natural gas in the manufacture of the finished products. No further progress of this project, however, has been reported.

Production and Trade

The records of Canadian production of ochres include in single item all grades of material from the low priced raw material to the high priced calcined products; in 1934 the total value was stated to be $65,966, as against $53,450 in the previous year. Our exports of mineral pigments are stated to have been 1,618 tons valued at $96,131 in 1934, as against 1,288 tons valued at $73,139 in 1933. Imports of all kinds of ochres, siennas, and umbers totalled 1,028 tons and were valued at $39,380 in 1934; in the previous year the total combined weights amounted to 1,078 tons, valued at $35,595. In addition there were imported prepared oxides, fillers, and related products, some of which were probably not ochres, valued at $753,827, as against a valuation of $573,607 in 1933.

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 due to the fact that the former do not require calcining to produce the desired colour.

ISSUED BY THE MINES BRANCH,
DEPARTMENT OF MINES, OTTAWA,
MARCH, 1935. (E.H.W.)

KAOLIN (CHINA CLAY) AND BALL CLAY IN 1934

Producing and Prospective Producing Localities

The only place where china clay has been produced commercially in Canada is near St. Remi d'Amherst. There a group of open pits and mines were 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 silica and china clay are produced. The china clay, an air-separated product, is used 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 during 1935. (*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.

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

There is a record of the production of 48 tons of kaolin, valued at $504 in 1934, but no record for the previous year. The exports, chiefly ball clays, are reported to have been 7,619 cwt., valued at $1,668; in the previous year the exports were 9,769 cwt., valued at $1,522. The imports of china clay were 654,999 cwt., valued at $250,705; in the previous year the imports were 509,068 cwt., valued at $210,067.

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.

ISSUED BY THE MINES BRANCH,
DEPARTMENT OF MINES, OTTAWA,
MARCH, 1935. (H.F.)

LIME IN 1934

Products and Producing Localities

Lime is marketed either in the form of quicklime or in the hydrated state. Quicklime, which in 1934 comprised about 84 per cent of the total sales, is sold in lump form, in pebble form, and as crushed quicklime. Hydrated lime, a specially prepared slaked lime, in the form of a very fine powder, is marketed in 50-pound, multi-walled bags.

Lime is manufactured in every province of Canada except Prince Edward Island, though production in Saskatchewan is intermittent and on a very small scale. Both high-calcium and dolomitic limes are produced in Nova Scotia, New Brunswick, Ontario, and Manitoba, but only high-calcium limes in Quebec, Alberta, and British Columbia. Ontario produced more than half of the total output of lime in 1934, and Quebec was the next largest producing province with somewhat less than one-third of the total Canadian output.

Important Developments and Prospective Producing Localities

During 1934, preparations were made by the Dominion Lime Co., Lime Ridge, Que., to manufacture "waterproof" lime which is a specially prepared pulverized quicklime developed and patented by Rockland & Rockport Lime Corporation of Rockland, Maine. This lime, it is claimed, yields a waterproof mortar and thus prevents the leaking of walls. It is marketed in 80-pound, airtight, multi-walled bags.

The Rockwood Lime Company, producing dolomite quicklime and hydrated lime, commenced production during 1934 at Rockwood, Ontario.

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

Production and Trade

Production of lime during 1934 consisted of 307,327 tons of quicklime valued at $2,239,657, and 59,990 tons of hydrated lime valued at $513,140. This compares favourably with the 1933 production of 267,927 tons of quicklime valued at $1,955,722 and 55,613 tons of hydrated lime valued at $476,584. Exports of lime amounted to 10,675 tons valued at $151,983. Imports, which are all from the United States, amounted to 571 tons valued at $10,821, according to data supplied by the United States Bureau of Mines.

The increased use of lime was due largely to the increased demand from the chemical, mining, and metallurgical industries, which industries now consume nearly 80 per cent of the total production.

Prices f.o.b. plants during 1934 were as follows: hydrated finishing lime, $12.50 per ton; masons' and chemical hydrate, $5.00 to $17.50 per ton; quicklime $5.00 to $10.00 per ton. The wide range in prices is due in large part to differences in the quality of the lime and to the geographical location of the plants. The higher prices prevail in Manitoba.

ISSUED BY THE MINES BRANCH,
DEPARTMENT OF MINES, OTTAWA,
MARCH, 1935. (M.F.G.)

LIMESTONE (GENERAL) IN 1934

Products and Producing Localities

Every province of Canada except Prince Edward Island has large deposits of limestone suitable for a wide variety of uses. In Saskatchewan the main deposits are not yet accessible, but boulders of dolomite, so plentiful in many parts of the province, have been utilized from time to time for a number of purposes. The chief products vary in the different provinces. In Ontario, Quebec, and Manitoba, the major portion of the output is converted into crushed stone for use as railroad ballast, road metal, and concrete aggregate. In Nova Scotia and British Columbia the chief product is flux stone, and in New Brunswick, agricultural limestone. In addition to these main products large quantities of limestone are used for other purposes in each province. The cement, lime, and building stone industries also utilize large quantities of limestone but their requirements are not included in the above.

Important Developments and Prospective Producing Localities

As a result of research conducted in the laboratories of the Mines Branch, which proved that certain large deposits of argillaceous dolomite in the Niagara Peninsula were of suitable composition for the manufacture of rock wool, an industry to manufacture this commodity has been established in Canada. In September 1934 Spun Rock Wools, Ltd., Thorold, Ontario, began production of a long-fibred rock wool made by a method entirely different from that used in any other rock wool or slag wool plant. Two other Canadian companies expect to commence production of rock wool during the coming year.

In the agricultural limestone field a trend toward the use of pulverized dolomite in place of high-calcium limestone is noted. This is due to the wider realization that magnesia as well as lime is required for the best growth of many crops, and has resulted in the opening up of several small dolomite quarries.

Production and Trade

The 1934 production of limestone for general use exclusive of that used for building stone, lime, and cement amounted to 3,345,668 tons valued at $2,703,995, compared with a production of 2,546,144 tons valued at $1,978,802 in 1933. 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. Some limestone for use in pulp mills in northern Ontario is 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 uses to which limestone is put. In 1934, according to the preliminary report of the Dominion Bureau of Statistics, limestone, exclusive of that used by the cement and lime industries, constituted 92 per cent of the total Canadian stone production.

ISSUED BY THE MINES BRANCH,
DEPARTMENT OF MINES, OTTAWA,
MARCH, 1935. (M.F.G.)

LIMESTONE (STRUCTURAL) IN 1934

Products and Producing Localities

The principal quarries from which limestone for building purposes is obtained are in the following localities: St. Marc des Carrieres, Quebec (4 quarries producing grey limestone); Montreal (2 large and several small quarries producing grey limestone); Queenston, Ontario (1 quarry producing silver-grey limestone with small quantities of buff and of variegated grey-and-buff); Longford, Ontario (1 quarry producing buff limestone); Tyndall, Manitoba (3 quarries producing mottled grey, mottled buff, and mottled variegated limestone). Quarries producing small quantities of building stone for local use are situated near Quebec City, and at Hull, in Quebec; and at Ottawa and Kingston, in Ontario.

The products of certain 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

Two quarries that were in the prospect stage in 1933 are now producing stone for major building projects; these are the quarries of Martineau Fils, Ltée (Morrison Quarry Co.), near Montreal, and Lake St. John Quarry Co. (formerly Simcoe Marble and Stone Quarries), at Longford. The Martineau quarry is opened in heavily bedded Chazy limestone at Village Belanger, and is supplying stone for buildings in Montreal and other points in Quebec. The Lake St. John Quarry Co. is working an olive-buff, magnesian limestone that occurs beneath the well known, light-coloured, high-calcium limestone formerly quarried at Longford, and is supplying stone to the Toronto market.

Production and Trade

Production of limestone for building purposes during 1934 amounted to 26,706 tons, valued at $222,085, compared with a production of 26,767 tons, valued at $163,714, in 1933. Only dimension stone marketed either in mill blocks or in finished state by the primary producers is included in the above data; the value of the work done on domestic limestone in cut-stone contractors' plants is not 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 1934

97477—6

were valued at $29,749, an increase of $19,873 over the value of the imports in 1933.

Prices of limestone in the mill block, f.o.b. quarry, range from 50 cents to $1.00 per cubic foot, depending on size of block and grade of stone; prices have remained almost constant during the past several years.

The small demand for building stone during 1933 and 1934 was in large part filled from quarried stock on hand, and many of the larger quarries were not operated, but quarried stocks are now largely depleted and practically all of the quarries will be in operation during 1935; several operators report that orders now received will keep their quarries in full operation during the next quarry season (from May until October).

ISSUED BY THE MINES BRANCH,
DEPARTMENT OF MINES, OTTAWA,
MARCH, 1935. (M.F.G.)

LITHIUM MINERALS IN 1934

Ores Mined and Producing Localities

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 operation 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. Prospecting has disclosed other lithium occurrences, mainly of spodumene, at Cat lake, north of the Bird river, and also in the Herb lake district, near Mile 81, on the Hudson's Bay Railway; no attempt at development of these remote deposits has been made.

Important Developments and Prospective Producing Localities

The only operations during the year were conducted on the Buck and Coe claims at Bernic lake, and consisted in laying the ground for opening up the property on a productive basis. For this purpose, the Lithium Corporation of Canada, of Winnipeg, has been formed and plans, in addition, to erect a chemical plant, at or near Winnipeg, to treat the ore mined for the production of lithium salts and also, later, of the metal. The minerals present on these claims are principally amblygonite, spodumene

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and triphylite, with only minor amounts of lepidolite; the amblygonite showings are the most important thus far recorded in Canada, and there are also exceptional amounts of triphylite exposed.

The principal use of lepidolite is in the glass industry, where, in the powdered form, it is employed in the production of heat-resistant (Pyrex-type) flint and opal glasses. Its lithia content being low as compared with that of amblygonite and spodumene, the latter minerals are generally preferred as raw material for the manufacture of lithium salts and chemicals. In Germany, however, such products, and also the metal, are made by a special process from low-grade lithium-mica (zinnwaldite).

The lithium chemical trade is a comparatively restricted industry, and the world consumption of lithium salts and chemicals has shown little expansion over a period of years. Some attention is being currently given to the use of lithia in ceramic glazes and enamel colours, to which it imparts the same improvements as to glass. There has been a large increase, however, in the production and use of the metal. The addition of lithium-calcium alloy to cast iron and steel melts has been found to effect marked improvements in the fluidity, structure, and physical properties of these metals; while, added to molten copper and copper alloys, it acts as a de-oxidiser and produces a metal of higher density and conductivity. Lithium-lead alloys are finding extensive application as bearing-metal, and have also been suggested as eminently adapted for cable-sheaths. The use of lithium hydride as a light, portable source of hydrogen, in place of transporting the gas in steel cylinders, is a possible new development.

Production and Trade

There has been no production of lithium ores in Canada since 1928. Lithia products imported are not recorded separately.

Trade journal quotations in 1934 for amblygonite averaged $35 per ton, and for lepidolite, $20 to $25 per ton. Spodumene was not quoted. Lithium metal (98 to 99 per cent) was priced at $15 per pound.

There is no present market in Canada for lithium ores; hence, until a plant for their treatment is erected, any production will have to find a market either in the United States or Europe. The American demand for amblygonite and spodumene is at present adequately supplied from the large deposits in South Dakota, while California and New Mexico furnish most of the lepidolite used. Owing to its comparative rarity, triphylite is rarely used as a source of lithia.

ISSUED BY THE MINES BRANCH,
DEPARTMENT OF MINES, OTTAWA,
MARCH, 1935. (H.S.S.)

MAGNESITE IN 1934

Products and Producing Localities

No magnesite, within the strict meaning of the term, is being produced in Canada at the present time. A magnesitic dolomite which is composed of an intimate mixture of magnesite and dolomite, and which, when properly processed, can be used in place of 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 as an ingredient of certain types of chrome refractories.

Important Developments and Prospective Producing Localities

A recent development of importance is the manufacture in Canada of a line of chrome and chrome-magnesia refractories by Canadian Refractories, Ltd., under licence from E. J. Lavino Co. of Philadelphia. Another recent development is the manufacture of refractory brick from dead-burned Canadian magnesitic dolomite. These brick are at present being made in England.

Deposits of earthy hydromagnesite occur in British Columbia near Atlin and Clinton, and large deposits of siliceous magnesite occur in the vicinity of Cranbrook. The reported successful application of flotation methods to the removing of silica and other impurities from magnesite is a development of importance as regards the siliceous magnesite deposits.

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 commercial magnesite are known to occur 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.

Production and Trade

During 1934, magnesitic dolomite products to the value of $382,927 were produced by the two Canadian companies engaged in their manufacture. This represents an increase of $22,799 over the production of 1933. Exports of magnesitic dolomite products amounted to 1,997 tons valued at $56,670 as compared with 2,320 tons valued at $63,056 in 1933. Imports of magnesite products consisting of magnesia pipe-covering, caustic and dead-burned magnesite, magnesite brick, and a small quantity of crude magnesite rock had a value of $469,198 as compared with imports valued at $325,146 in 1933.

The recent trend in the making of magnesia products has been largely toward the production of highly refractory materials such as are used for

lining the bottoms of metallurgical furnaces. Caustic-calcined magnesia was formerly much in demand for stucco material, but very little is now used for this purpose. It is, however, being used for fettling the bottoms of open-hearth furnaces and for the construction of floors and floor tiles.

ISSUED BY THE MINES BRANCH,
DEPARTMENT OF MINES, OTTAWA,
MARCH, 1935. (M.F.G.)

MARBLE IN 1934

Products and Producing Localities

Marble quarried for the purpose of sawing into slabs used in the polished state for the ornamentation of buildings ranks first in value, but it is exceeded in tonnage by that sold for the making of terrazzo chips, stucco dash, whiting substitute, and artificial stone.

The principal centre of marble production in Canada is at Philipsburg, Quebec, where Wallace Sandstone Quarries, Ltd. is producing clouded grey marbles, some of which are lined and tinted with green and pink. Black marble is also quarried by this company and a large marble-finishing mill is also operated in connection with the quarries. The limestone quarried for building purposes at St. Marc des Carrieres, Portneuf county, Quebec, takes a good polish and yields a dark brownish grey marble; a small proportion of the output of these quarries is thus utilized.

In Ontario, black marble is quarried at St. Albert by Silvertone Black Marble Quarries. At Longford, the Lake St. John Quarry Co. is producing two varieties of very fine-grained, faintly mottled, buff marble and also a mottled brown marble. This stone is also quarried for exterior building stone and has been used for sculpturing. At Bancroft, a number of varieties of handsome marble are available, the most striking of which is a clouded-grey breccia in which the bond is of a rich chocolate colour. The Bancroft quarries were idle during 1934 but will be in operation in 1935.

In Manitoba, mottled gold-and-buff and mottled purplish red marbles are available in the quarry of the Winnitoba Marble Co. at Fisher Branch, 100 miles north of Winnipeg. Rose-coloured and mottled red marbles are available in the quarries of the Western Marble Co. on the Hudson Bay railway north of The Pas, and this company also owns a deposit of bluish green serpentine at Hole River on the east shore of Lake Winnipeg. There was no production from any of the marble quarries in Manitoba during 1934.

In British Columbia, the Canadian Marble and Granite Works, Ltd. operates a marble quarry and marble mill at La Blanche station on the Lardeau branch of the Canadian Pacific railway, 8 miles north of Kootenay lake. This quarry yields white and bluish grey marble; the greater part of the output is used for the making of monuments.

Important Developments and Prospective Producing Localities

The marble quarries at Bancroft, Ontario, which have been idle for the past two years, have been leased to Rock Construction Co., Ltd., of Toronto, and will be operated during 1935; five varieties of marble (green, pink, buff, and two varieties of breccia) will be marketed.

There are throughout Canada many deposits of serpentine and of metamorphosed limestone tinted and figured in a singularly beautiful

fashion. The majority of the deposits have never been investigated; others have been worked to a depth of only a few feet. The principal reason why many of the Canadian deposits have not been worked is that the present demand in Canada for any one type of marble, other than a staple variety such as white, is comparatively small.

Production and Trade

The production of marble during 1934 amounted to 10,292 tons valued at $54,695, as compared with a production of 10,897 tons valued at $65,913 in 1933. Exports of marble are recorded with exports of granite and the combined exports during 1934 amounted to 1,153 tons valued at $9,766, as compared with exports of 964 tons valued at $12,997 in 1933. Imports of marble in 1934 were valued at $37,984 as compared with imports valued at $52,758 in 1933. Marble is imported mostly in the form of mill blocks and unpolished slabs—the sawing and polishing being done in various marble mills throughout Canada. Most of the imports are supplied by the United States, Italy, Belgium, France, and Great Britain; practically all of that coming from Great Britain originates in various European countries. Large stocks of foreign marble imported during the period of active building construction in 1929 are still on hand in Canada and this accounts for the low present volume of imports.

The Canadian market calls almost exclusively for interior decorative marble, and there is very little used for exterior building purposes. Grey marbles comprise the greater part of the domestic production, but within the past few years the colour range of Canadian marbles has been widened by the production of a number of highly coloured varieties. In recent years an increasing amount of marble has been used in the form of terrazzo in place of polished slabs.

The market for Canadian marbles is at present almost wholly domestic and thus production depends almost entirely on the volume of building construction in the Dominion. However, efforts are now being made by some Canadian producers to introduce their marble into foreign markets. The demand for marble of certain colour changes from time to time. At present there is very little call for red and blue marbles, but buff and black marbles are in vogue. Prices depend on the quality and rareness of colouring but they are also governed largely by the prices of foreign marbles, many of which enjoy a world-wide market.

ISSUED BY THE MINES BRANCH,
DEPARTMENT OF MINES, OTTAWA,
MARCH, 1935. (M.F.G.)

MICA IN 1934

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, almost the entire 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. A further small shipment of scrap-grade, white mica, was made from a deposit near Enderby, B.C., and sent to a mill in Vancouver for grinding. An attempt to re-open some old muscovite properties in the Bergeronnes district, Saguenay county, Que., is reported to have been abandoned.

The mica-grinding plant at the Blackburn mine, in Templeton township, Que., continued in intermittent operation during the year and reported about double the volume of sales over 1933: most of the powder produced goes to the roofing and rubber trades. A small tonnage of ground mica was also produced by a mill at Vancouver, B.C., operating on mine-run muscovite of scrap grade derived from a deposit near Enderby, in the Okanagan district. Grinding and sizing tests were run in the Mines Branch Ore Dressing Laboratories on a trial shipment of mica schist from Baker Inlet, near Prince Rupert, B.C.: the rock is soft and easily pulverized and consists essentially of fine, white, flake mica. The deposit is said to be large, and being located on tide-water, is well situated for development.

Production and Trade

The following table shows the Canadian production of the five leading mica products:

	1934		1933	
	Lb.	Value	Lb.	Value
Knife trimmed	61,003	$25,628	8,591	$ 3,923
Thumb trimmed	90,726	27,360	51,881	8,397
Splittings	75,050	33,120	74,550	27,446
Rough cobbed	2,459	514	....	....
Scrap	1,766,031	10,449	1,753,375	9,518

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 "thumb-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.

The Canadian exports of amber mica were valued at $117,802 in 1934, as against $46,213 in the previous year. Mica imports, including manufactured products, were valued at $62,880 in 1934, as against $33,506 in 1933.

The improved market for Canadian mica registered in 1933 was well sustained this year, and dealers reported a largely-increased demand for trimmed sheet of all sizes. Value of sales registered a large increase (97 per cent) over 1933. Part of such sales continued to be met from accumulated stocks on hand, but there was a notable increase in the amount of newly-mined mica, most of it derived from mines in Quebec province. Until a few years ago, small-size mica recovered from old mine dumps contributed to the production, but these sources have now become practically exhausted and furnish very little in the way of merchantable sheet or even scrap.

While due in some measure to the generally improved tone of business, the increased demand may be attributed largely to a marked falling-off during the last year or two in shipments from Madagascar, which country has been for some time a serious competitor to Canada in the amber mica trade. Producing more cheaply, and putting up the product in a form more acceptable to the trade, Madagascar operators succeeded in gaining a strong foothold in the world market, with resultant depression in the Canadian industry. With a progressive decline in competition from this source, Canadian operators will stand to benefit accordingly and this country may expect to regain its former rank as the world's leading producer of amber mica.

One result of the present situation, and one which should benefit the industry, is that dealers, in order to gain the British market, have been led to discard the earlier practice of selling block or sheet mica in the thumb-trimmed state and are adopting knife-trimming. Thumb-trimmed sheets commonly contain 25 to 30 per cent of waste in the form of rough, broken edges, whereas knife-trimming reduces such waste to a minimum.

Dealers' quotations at the close of the year were as follows:—

Knife-trimmed sheet		*Splittings*	
1 x 3 inches	35c. per pound	1 x 1 inches	48c. per pound
2 x 3 inches	50–55c. per pound	1 x 2 inches	50c. per pound
2 x 4 inches	75–80c. per pound		
3 x 5 inches	$1.25–$1.35 per pound		
4 x 6 inches	$1.75–$1.85 per pound		
5 x 8 inches	$3.00 per pound		

Ground mica: 20 mesh, $25 per ton; 60 mesh, $35; 120 mesh, $45: all f.o.b. Ottawa, in ton lots.

ISSUED BY THE MINES BRANCH,
DEPARTMENT OF MINES, OTTAWA,
MARCH, 1935. (H.S.S.)

MOULDING SANDS (NATURAL BONDED) IN 1934

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, St. Ouens, 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

Shipments of moulding sands to Edmonton were made this year from a deposit at Leduc, Alberta; within the last four years 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. Shipments continued from a recently developed deposit about 2 miles south of New Westminster, British Columbia; in the east a small initial shipment was also made from Brigham, Quebec.

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; mechanical analytical tests on large-scale samples from such deposits were made by methods adopted by a Joint Committee on Moulding Sand

Research under the auspices of the American Foundrymen's Association. The Mines Branch, Department of Mines, Ottawa, had representation on this committee. 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 10,126 tons valued at $8,528; in the previous year the production was 7,717 tons valued at $9,635. No exports were recorded. Formerly for a period of approximately 25 years large quantities of moulding sand were shipped from the vicinity of Ruthven and Leamington in Essex county, Ontario, to United States points including Cleveland, Detroit, Saginaw, Sandusky, and Toledo. These shipments ceased about 1906 with the exhaustion of the then known deposits. Shipments were also made about 1916 from a deposit near Metchosin on Vancouver island to three localities in California. All these sands were sold in competition with American sands.

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 since 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 general lag in business which severely hit the moulding sand industry during 1931 and 1932 still remains. Although a greater tonnage was produced in 1934 than in 1933 the value was much lower. This may be responsible to some extent to a combination of two things: to a belief in the foundry trade industry that our domestic moulding sands are not as good as most of the imported ones and that these imported ones are now more easily obtained. Very few foundrymen, particularly those who operate in the large cities, are aware that local supplies have been so widely used. No doubt if some of these deposits were better exploited the amount of fairly similar foreign sands used could be reduced. Due to the cheapness of the commodity and higher freight rates than for ordinary sands and gravels, the use of any moulding sand, unless it is favourably known, is confined to a limited area.

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,
MARCH, 1935. (C.H.F.)

PYRITES IN 1934

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., in Three Rivers, Quebec, underwent 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 concentrates produced at the Eustis mine, near Sherbrooke, Quebec.

There is no general market in Canada for lump pyrites, although one acid plant still imports a small tonnage annually. While the Freeman process of flash roasting, especially designed for treatment of by-product flotation fines recovered in the treatment of copper ores, 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 19,600 tons of pyrites to the United States; shipments were made both from Quebec and from British Columbia.

Production and Trade

No separate records are available showing the quantity of pyrites produced annually in Canada. Plants producing pyrites supplied 5,501 tons of sulphur; the Dominion Bureau of Statistics also reports that 9,821 tons of sulphur contained in pyrites were exported; some of this latter quantity must have been shipped from stored stock. The total pyrites produced must have been approximately 11,600 tons. 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 concentrates exported amounted to 9,821 tons valued at $94,623; in the previous year 15,347 tons of sulphur were contained in exported concentrates, valued at $121,280. It may be assumed that the exported concentrates contained about 50 per cent of sulphur.

ISSUED BY THE MINES BRANCH,
DEPARTMENT OF MINES, OTTAWA,
MARCH, 1935. (A.W.G.W.)

SALT IN 1934

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 1934 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 recovery by evaporation from brines produced by leaching of salt from the waste piles of the mine.

Important Developments and Prospective Producing Localities

There were several new developments in the Ontario field during the year. The Goderich Salt Company, at Goderich, Ontario, installed a new and modern triple-effect vacuum evaporator thereby greatly increasing their tonnage capacity. The Warwick Pure Salt Company, Limited erected a new plant consisting of open pans and started operations, supplying a local market. This plant is about one mile west of Warwick and 25 east of Sarnia. The Walker Salt Corporation drilled a new well for salt at Port Franks, Ontario, and commenced the erection of an open pan plant adjacent to the well. They expect to start production in March, 1935.

During the year the Canadian Industries, Limited erected and put in operation at Cornwall, Ontario, a plant for the manufacture of caustic soda and chlorine using salt from their plant at Sandwich, Ontario. The products from this plant are being used directly in the paper mills of the district.

The Brunner Mond Company at Amherstburg, Ontario, are erecting a plant to recover calcium chloride from their waste material resulting from the manufacture of soda ash from the brines used in their process.

In Nova Scotia, the Malagash Salt Company showed a substantial increase in production over 1933. A geophysical survey of an area in the neighbourhood of this deposit was made during the year which yielded some interesting results.

The Neepawa Salt Company of Neepawa, Manitoba, maintained steady production throughout the year. This company has recently been purchased by the Canadian Industries, Ltd. Grainer pans are used at this plant, and their product is finding a ready market in the West.

The Simpson Oil and Gas Company, at Simpson, Saskatchewan, continued to operate their small open pan unit which has a rated capacity of 5 tons of coarse salt per day. Their product finds a ready market locally. The source of their raw material is a brine obtained in a drill hole which was drilled for oil to a depth of 3,435 feet.

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 latter part of the year to revive the salt industry in this area.

In a well drilled for oil near Gautreau, New Brunswick, south of Moncton, extensive beds of rock salt were encountered a number of years ago 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 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. The first salt bed was penetrated at a depth of 920 feet from the surface and one of the salt beds had a thickness of over 480 feet and ran over 90 per cent sodium chloride in the crude sample. The apparent great thickness of salt formation in this locality may possibly be due to the steep angle of pitch of the beds.

Production and Trade

Canada produced 321,753 tons of salt, valued at $1,954,953; in 1933 the production was 280,115 tons valued at $1,939,874. The exports of salt from Canada in 1934 were 6,597 tons, valued at $48,097, compared with an export in 1933 of 5,335 tons, valued at $43,461. The imports of salt were 138,794 tons valued at $586,033 as against 135,620 tons, valued at $651,237 in 1933. 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 1934 showed a marked increase over the preceding year, and taken for a period of years, the market for salt in Canada is steadily increasing and the industry is in a sound condition.

A large tonnage of salt is still imported duty free, for use in the fisheries. This is due to the fact that 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 has for this use been curtailed in recent years, such a condition is probably only temporary. 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 and considerable importations of salt can therefore be expected.

Experiments have been carried on with encouraging results in Nova Scotia and elsewhere for the past few years to determine the effect of salt with a mixture of clay as a surface veneer on gravel highways, in order to decrease, if not entirely eliminate, the dust nuisance and heavy main-

tenance cost of such roads. This matter is now being studied seriously not only by the salt producers in Canada and the United States, but by the National Research Council at Washington, who have appointed a special committee to investigate and carry on research work on this special phase of stabilized road. If the producers of salt 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, since 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.

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DEPARTMENT OF MINES, OTTAWA,
MARCH, 1935. (L.H.C.)

97477—7

SILICA IN 1934

Ores Mined and Producing Localities

The materials produced in this industry are:—

Quartz for smelter flux and ferro-silicon; Quartzite for ferro-silicon and silica brick; Silica Sand for the manufacture of glass, carborundum, sodium silicate, etc., also for sand blasting 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 ferro-silicon 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 sand blasting, etc.

The Canadian Kaolin Silica Products, Ltd., from their property at Lac Remi, 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 its plant for the manufacture of silicate of soda to full capacity. The Canadian Carborundum Company, at its plant at Niagara Falls, Ontario, are adding to the furnace capacity for the manufacture of sodium silicate. Although both these firms are using imported silica sand at the present time, they form a ready market for material from a Canadian deposit just as soon as any producer can guarantee a continuous supply of a product sufficiently pure to meet the rigid specifications required for this purpose.

97477—7½

During the year, a company was formed called Flint Sands, Limited, for the purpose of developing the loosely consolidated sandstone deposit at Guigues, Quebec, 11 miles north of Ville Marie. A pilot mill was erected and a small production made. Plans are completed to start production on a commercial scale in April, 1935.

W. R. Barnes of Hamilton, Ontario, opened up a sandstone deposit at Springvale, Ontario, several miles west of Hagersville. This sandstone, crushed and screened into different sizes, is being used as a steel foundry moulding sand in the Hamilton district and elsewhere. A sandstone deposit near Milton, Ontario, is also being quarried for use as patching material for furnace linings.

Canadian Refractories, Ltd., are developing a deposit of refractory clays 7 miles north of Smoky falls, Ontario. Associated with these clays are beds of silica sand which they hope to be able to separate and clean to a purity satisfactory for several of the silica sand markets.

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 ferro-silicon and silica brick, the market for the finished product limits the quantity of silica required, and as both these industries showed an improvement in 1934 over the previous year, the consumption of silica for these uses increased materially.

The demand for high-grade silica sand remained steady and while there are still appreciable quantities of Belgian sand being 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.

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

Production and Trade

The total tonnage of quartz and silica sand produced in Canada in 1934 amounted to 272,075 tons valued at $489,872; the production in 1933 was 185,783 tons valued at $297,820. There were 2,611 M silica brick produced in 1934 at a value of $93,268; in the previous year the production was 636 M valued at $23,185. No exports of silica or silica products were recorded during the year. The tonnage of the various grades of silica imported during 1934 amounted to 100,828 tons with a value of $308,045, compared with 70,761 tons valued at $270,569. The imports of silica brick in 1934 was valued at $210,190, as against $147,901 in 1933.

The price range per ton for the several grades of silica varies greatly, depending on the purity of the product and also 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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DEPARTMENT OF MINES, OTTAWA,
MARCH, 1935. (L.H.C.)

SODIUM SULPHATE (NATURAL) IN 1934

(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 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.; the Sodium Corporation, Alsask, Sask.; Horseshoe Lake Mining Company, Ormiston, Sask.; and the Dominion Sodium Refineries, Ltd., Fusilier, Sask., with small tonnages from several other properties where new plants are being erected.

Important Developments and Prospective Producing Localities

The Natural Sodium Products, Limited, at Dunkirk, Sask., completed their new construction program early in the year and have now ample power and are operating two driers.

The Horseshoe Lake Mining Company were in full operation during the open months of the year supplying the demand for sodium sulphate by the nitre cake plant at Copper Cliff, Ontario.

There are several new developments in western Canada in this industry.

The Eastcrest Holding and Development Company, with head office at Calgary, Alta., is erecting a dehydrating plant near Oban, Sask., and plan to use material obtained from Whiteshore lake, $1\frac{1}{2}$ miles away. They have installed a pipe-line and are pumping brine into a small lake near their plant and then pump again into a large sump they have excavated on a side hill. In this they allow the salts to crystallize and then remove them to a stock-pile preparatory to drying.

At the central part of Whiteshore lake, the Midwest Chemical Company have erected a 50-ton dehydrating plant using direct rotary drier working on harvested intermittent crystals. They are now in a position to ship and their shipping point is at Palo, Sask., 3 miles north of the plant.

Alberta interests have taken up leases on Muskiki lake, 60 miles east of Saskatoon, Sask., and have bought the old plant site. They 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 controlled by Salts and Chemicals, Ltd., one of the early companies in this industry.

Activity has been quite marked during the past year in this industry, and many enquiries have been received by the department asking for information on various phases, from methods of harvesting and dehydrating to marketing problems.

It is decidedly 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 were proven up in the few deposits examined in detail. 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 1934 amounted to 65,392 tons valued at $590,325; compared with a production in 1933 valued at $485,416, the tonnage in that year not being reported. Although there were 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 1934, including Glauber's salt, salt cake, and the acid sodium sulphate, amounted to 13,106 tons valued at $153,115; in 1933 the imports were 4,064 tons valued at $63,597.

There was a substantial increase in the production of natural sodium sulphate during the past year due to the increased demand from the paper trade and of the nitre cake plant at Copper Cliff, Ont.

It is quite probable, as time goes on, that the product from these western deposits will find a rapidly extending market, as the by-product material from the manufacture of hydrochloric acid is each year decreasing in volume due to the manufacture of hydrochloric synthetically. This increased market will probably not be confined to Canada, since 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 possibilities of the product from these deposits competing in European and other foreign markets look decidedly promising.

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SULPHUR IN 1934

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 concentrates. In addition, wherever sulphide ores are treated to recover the valuable metal content by-product sulphur dioxide gas is a waste product which 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 or for the production of liquid sulphur dioxide; 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. At present there has been no commercial production in Canada, although three firms are working independently on this problem in different parts of the country.

Production and Trade

The Dominion Bureau of Statistics reports the equivalent amount of sulphur recovered from smelter gases as being 45,805 tons in 1934; in addition, 5,501 tons of sulphur were contained in pyrites mined; the imports of sulphur in all forms were 157,697 tons, valued at $2,589,311 in 1934, as against 140,810 tons, valued at $2,529,920 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 price per long ton at Atlantic ports was $22 to $25; 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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TALC AND SOAPSTONE IN 1934

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 is 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. In addition to furnace stone, the company also fashions soapstone monuments, stoves, mantels and other interior trim, as well as a variety of turned ornamental objects. 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.

In British Columbia, there is a small, intermittent production of ground, off-colour talc, utilized chiefly in the roofing trade. The small tonnage reported in 1934 is stated to have come from Anderson lake, on the P.G.E. railway, and from Sooke, on Vancouver island.

Important Developments and Prospective Producing Localities

Outside of the new soapstone operations in the Eastern Townships, Quebec, mentioned above, there have been no fresh developments of consequence reported. No further work has been undertaken on the known occurrences of soapstone in western Ontario, but the Western Marble Company, of Winnipeg, reports having located a deposit in the Lake of the Woods region, from which some trial blocks were taken and shipped to Winnipeg for cutting into panels and slabs. Nothing more has been

done on the soapstone discovery at Verona Siding, near Hope, B.C., mentioned in the 1932 review, and there have been no further developments in connection with the steatite occurrences on the Alberta-British Columbia boundary, near Castle.

Production and Trade

The total Canadian production of ground talc in 1934 was 13,959 tons, valued at $136,480; in 1933 the production was 15,181 tons, valued at $143,156. In 1934 there was also a production of cut soapstone valued at $44,297, being slightly more than in the previous year, when the production was valued at $43,593. In 1934 the exports were 9,386 tons of ground talc, valued at $103,631, as against 10,725 tons, valued at $116,950, in the previous year. In the same years the imports were, respectively, 2,897 tons, valued at $44,905, and 2,149 tons, valued at $48,650.

Prices showed little change from the 1933 level, being $17.50 for the best grades, $11 for the intermediate, and $8 for the lowest, all f.o.b. mills.

Nothing of importance developed in the talc and soapstone situation during the year. Production from the Madoc mines, which in recent years has ranged from 12,000 to 15,000 tons annually, fell off about 8 per cent to 13,934 tons, valued at $136,480, from the 1933 figure, which was 15,181 tons, valued at $143,156. The output of block soapstone registered a slight increase in value.

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WHITING SUBSTITUTE IN 1934

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, and putty. In lesser quantity it is used in the manufacture of moulded articles, in certain cleaning compounds and polishes, as a ceramic glaze, and for various other uses. The chief differences between true whiting and whiting substitute are that the latter has a much lower capacity for absorbing oil and the individual particles are inclined to be sub-angular rather than rounded.

Plants manufacturing whiting substitute are located in Montreal and Winnipeg, and are operated by Pulverized Products, Ltd., and by Gypsum, Lime and Alabastine, Canada, Ltd., respectively. Prior to 1934 Brandram-Henderson, Ltd. manufactured whiting substitute at Halifax but this firm has now discontinued the manufacture of this commodity.

Important Developments and Prospective Producing Localities

Several companies and individuals are investigating the possibilities of producing whiting substitute from deposits of marl, calcite, white limestone, and white marble in various parts of Canada. Particular interest has been manifested in marl deposits, which are abundant in Canada, but so far as known the commercial production of a whiting substitute of good quality from marl has not yet been achieved.

Closely related in uses to whiting substitute are precipitated chalk and by-product precipitated chalk. The former is made by re-carbonating milk-of-lime made from high-calcium quicklime and is distinguished by its high degree of fineness and by its freedom from impurities. It is used for medicinal purposes; in the preparation of certain grades of salt; in the manufacture of special types of paper and for a number of other purposes. 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. Neither precipitated chalk nor by-product precipitated chalk is produced in Canada, although the raw materials for each are available. During 1934 one Canadian company carried on investigations into the possibilities of producing by-product precipitated chalk.

Production and Trade

There is no official record of production and exports from Canada of whiting substitute. Considerable quantities of the material are imported into Canada from the United States, but no separate record of these imports

is kept. However, in 1934, imports of chalk whiting originating in Europe amounted to 12,034 tons valued at $119,643, as compared with imports of 9,953 tons valued at $91,744 in 1933.

The price of the material has remained constant in recent years and is somewhat below that of imported chalk whiting. The market for whiting substitute in Canada has been developed largely by the present producers and these firms are well equipped to take care of an increased demand.

ISSUED BY THE MINES BRANCH,
DEPARTMENT OF MINES, OTTAWA,
MARCH, 1935. (M.F.G.)

MISCELLANEOUS MINERALS IN 1934

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. Previous to 1932 there was a small annual production from deposits in the Lake Ainslie district, Nova Scotia, the product being marketed locally. Occurrences of the mineral have been reported, or deposits have been worked intermittently, in the provinces of Nova Scotia, New Brunswick, Quebec, northern and western Ontario, and in British Columbia. Some of the crude ore produced in the earlier days was used by domestic manufacturers of paints, but the bulk of the output was exported. The much stricter specifications of modern industry render it improbable that there will develop any important market for run-of-mine ore, and future development will require the provision of some type of cleaning and grinding equipment to prepare the barite in the form and of the purity required by modern industry. There being no lithopone or barium chemicals industry in Canada, no demand exists at present for crude ore; there seems little prospect, therefore, of any immediate revival of this industry.

In 1934, quotations in the United States were $5 to $7 per ton for the best grades of crude ore (minimum 95 per cent pure barium sulphate), and $23 per ton for prime bleached and floated powder, all f.o.b. mine or mill. No Canadian production is reported in 1934 and only 20 tons valued at $60 in 1933. Our imports were 1,557 tons valued at $26,397 as against 1,587 tons valued at $28,255 in 1933.

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. 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.

Magnesium Sulphate. Natural hydrous magnesium sulphate 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 of commercial grade from some of the deposits which occur; there was considerable production some years ago from one lake in Saskatchewan and more recently from another lake in British Columbia. In 1933 a small experimental plant, said to have a daily capacity of 3·5 tons of refined salt, was erected at Ashcroft to treat crude

salts recovered from Basque lake, B.C.; additional equipment to enlarge the plant to 10 tons daily capacity is to be installed later. There was a small production in 1934; previously there had been production in 1923 from Basque lake and in 1920 from a lake near Clinton. High freight rates limit the area which can profitably be served by production in British Columbia and the local demand is small.

Phosphate. The only important occurrences of phosphate rock in Canada that have been noted comprise the apatite deposits in basic Precambrian rocks (pyroxenites) of the Ottawa-Kingston area in Ontario and Quebec, and the low-grade sedimentary phosphates of the Crowsnest region near the boundary between southern Alberta and British Columbia. Very little mining has been done in the east in recent years and the small production has been recovered as a by-product during operations for the production of mica. In the west extensive exploration has failed to disclose the existence of high-grade ore; some experimental shipments of low-grade material have been sent to the fertilizer plant at Trail, but most of the supplies required for this plant are drawn from Montana and Idaho. In 1932 plants in Eastern Canada secured part of their requirements from Morocco but most of the supply comes from deposits in Florida or Tennessee. Our production in 1934 was only 81 tons valued at $683; in the previous year it was 2,214 tons valued at $5,475. The imports in 1934 were 31,775 tons valued at $165,240 as against 18,351 tons valued at $74,527 in 1933.

Titanium. Ilmenite, carrying from 18 to 25 per cent titanium, occurs in several places in Quebec province. Small quantities have been shipped from time to time to various points; the deposits at St. Urbain, in Charlevoix county, Quebec, were formerly operated by the General Electric Company, the shipments going to the works at Lynn, Mass. These deposits are noted for the high rutile content of the ore, the only ore of its kind in Canada. Shipments from other sources have, in past years, gone chiefly to Niagara Falls, N.Y., where the ore was utilized for the production of ferro-titanium. So far as is known no active steps are being taken to establish a titanium producing industry in Canada.

Volcanic Dust. Volcanic dusts are found in Saskatchewan, Alberta, and British Columbia. The material is used both as a filtering medium, as a filler, and as an abrasive. There has been intermittent production in Saskatchewan and in British Columbia. In 1934 there was a small production from near Williams lake, B.C. The total production in 1934 was 31 tons valued at $320; in the previous year there were 118 tons sold from stock, valued at $2,360. 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 $25,142, were imported in 1934; in 1933 the value of these imports was $18,113.

Oil Shale. Shales from which hydrocarbons can be obtained by destructive distillation are found both in Nova Scotia and in New Brunswick. There has been considerable field activity in exploration and much laboratory work has been undertaken to determine the probable oil yield

of representative samples to ascertain other important factors affecting the recovery of crude oil by destructive distillation, and to design treatment processes. No commercial developments have taken place and none are in immediate prospect.

Peat Fuel. There is very little activity on peat bogs in Canada, except for some digging for local use. Slightly less than 500 tons were dug by hand on bogs at Morewood, about ten miles from Kemptville, Ontario, for local use in 1934. In addition a few carloads were shipped from old stockpiles at Alfred, Ont.

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DEPARTMENT OF MINES, OTTAWA,
MARCH, 1935. (A.W.G.W.)

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COAL IN 1934

Coal Mined and Producing Localities

The provinces of Nova Scotia and New Brunswick and the Yukon Territory produce only bituminous coal. The 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 produce only lignite coal.

Important Developments and Prospective Producing Localities

In Nova Scotia large expenditures are under way and in contemplation to increase the production of existing collieries and to decrease cost of production by consolidation of colliery workings and by winning coal from underlying or overlying seams to existing haulage ways and shafts by cross-measure tunnels, especially in the submarine field off the Sydneys.

In Alberta strip mining operations are being extended in the Sheerness area. Two large new shafts have been sunk near Lethbridge by the C.P.R. for the purpose of opening a new colliery which will be electrically equipped. Additions were made to both the wet washing and air cleaning plants at the Greenhill mine, Blairmore. Coal cleaning plants, of the capacities indicated, have been or are being installed by: Cadomin Coal Company, Ltd., 120 tons per hour; Luscar Collieries, Ltd., 55 tons per hour; McGillivray Creek Coal & Coke Company, Ltd., 100 tons per hour. At the International mine experimentation was carried on to determine the efficiency of wet washing as against dry or air cleaning.

In British Columbia an improved air cleaning plant at Michel colliery contributed toward increased business with Manitoba.

More complete mechanization of coal mines is gradually being brought about throughout Canada and greater efforts are being made, through more careful preparation of the coal, to meet the rapidly growing more specialized requirements of the market.

Production and Trade

Canada's coal output in 1934 amounted to 13,795,649 tons; this represented an advance of 15·9 per cent over the 1933 total of 11,903,344 tons. Mines in Nova Scotia produced 6,340,790 tons or 39 per cent above the preceding year's output. Shipments of Canadian coal to St. Lawrence ports in 1934 were the largest in the history of the coal trade. New Brunswick's production amounted to 314,681 tons, and was the highest on record. Manitoba produced 3,037 tons in 1934. A slight decline was recorded in Saskatchewan's output as compared with 1933; the totals were 903,776 tons and 927,649 tons, respectively. Alberta's output reached a total of

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4,748,074 tons; in the preceding year 4,718,788 tons were mined. An advance of 7·4 per cent was shown in British Columbia's production of coal during the year. British Columbia's production, which in 1933 was the smallest recorded for the last forty years, increased 118,000 tons (to a total of 1,500,000 tons) in 1934; this increase being wholly from the Crowsnest Pass area and largely due to the Dominion subvention enabling coal from this area to compete in the Manitoba market. The Yukon output in 1934 was 638 tons.

Imports of coal into Canada during the year totalled 13,813,657 tons, a 20·5 per cent increase over the tonnage imported a year ago. Anthracite importations in 1934 consisted of 1,804,127 tons from the United States, 1,643,516 tons from Great Britain, 72,103 tons from Germany, 17,557 tons from Belgium and 6 tons from Newfoundland. Receipts of bituminous coal totalled 10,273,557 tons, made up of 9,943,162 tons from the United States, 329,726 tons from Great Britain and minor tonnages from Japan, Norway, Germany, Newfoundland and Sweden.

The total amount of coal made available for consumption during the year was 27,302,971 tons as against 23,110,087 made available for consumption in 1933.

Corresponding with increased production and imports, there was a considerable increase also in the amount of Canadian coal moved under Federal Government assistance; it is estimated that some 2,368,803 tons were moved in this way in 1934, as against 1,932,711 tons in 1933 and 1,124,788 in 1932.

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 during the seven years since the latter came into effect is over 7,000,000 tons, at a cost to the Government of nearly $7,000,000. The administration of this Government assistance is carried out by the Dominion Fuel Board.

Other Government assistance to the coal mining industry is given through the Fuel Testing Laboratories of the Mines Branch, Department of Mines, where, during 1934, research has been continued on the characteristics of Canadian coals, with special reference to their classification, their chemical and physical properties, the effects of washing and sizing on their marketability, and on the suitability of their use in by-product coke ovens—this last with a view to displacing United States coals now being used for making gas and coke. Research on the applicability of hydrogenation for the production of motor spirits and other oils from Canadian coals is also being carried out. Other tests are being made on the briquetting of fines and on the behaviour of Canadian coals in domestic heating plants.

With continued assistance in the transportation of Canadian coal from the mine to Canadian markets, and further increase in industrial activity, it is felt that the improvement in the situation in the coal mining industry evident in 1934 will be continued in 1935.

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DEPARTMENT OF MINES, OTTAWA,
MARCH, 1935. (J.McL.)

COKE IN 1934

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, Ontario, Manitoba, Saskatchewan, and Alberta.

Important Developments and Prospective Producing Localities

The Dominion Steel and Coal Company put into operation during the year a new, modern coke crushing and screening plant in connection with its by-product coke ovens at Sydney. Considerable quantities of coke from these ovens were sold throughout the Maritime Provinces for use as a domestic fuel.

The Montreal Coke and Manufacturing Company continued during 1934 to use Nova Scotia coal to the extent of 35 per cent of the total coal charged to the ovens.

The coke ovens at Hamilton and at Sault Ste. Marie continued to market increasing quantities of coke for use as domestic fuel.

The Winnipeg Electric Company, which formerly used United States coal exclusively, is now using 100 per cent Canadian coal (Michel colliery) in their ovens at Winnipeg. Comprehensive tests were made in the Fuel Research Laboratories in Ottawa on washed Cadomin coal to demonstrate its suitability for use in these by-product ovens.

The International Coal and Coke Company, at Coleman, Alberta, continued to supply an improved beehive oven coke to the smelter at Trail, B.C. Some experimental work was undertaken at the Greenhill mine of West Canadian Collieries in the production of a low-temperature coke for domestic use.

The new coke and gas plant of the British Columbia Electric Power and Gas Company, Limited, at Vancouver, B.C., is now supplying for local domestic use an improved coke, small quantities of which are being marketed in Seattle.

Production and Trade

The total production of coke in 1934 is reported as 2,266,757 tons as compared with 1,772,164 tons in 1933. The production in the eastern provinces, Nova Scotia, New Brunswick, and Quebec, in 1934 was 689,662 tons as against 464,658 tons in 1933. In Ontario the 1934 production was 2,292,697 tons as compared with 1,769,327 tons in 1933, while in Manitoba, Alberta, and British Columbia the 1934 production was 207,243 tons as against 177,055 tons in 1933.

During the year 1934 the production of coke from bituminous coal in Canadian ovens increased nearly 30 per cent over that of 1933. The amount

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of Canadian coal used for this purpose increased from 604,017 tons to 854,324, or 41 per cent; that of imported coal from 1,861,944 tons to 2,281,681, or only about 22½ per cent.

Exports of coke in 1934 amounted to 7,376 tons as against 5,199 tons in 1933.

Canada's imports of coke in 1934 were 930,221 tons as compared with imports in 1933 of 644,075 tons.

Further improvement in the coke situation is looked for in 1935.

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NATURAL GAS IN 1934

Producing Localities

Alberta continues to be the leading producing area in Canada, accounting for 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. A small field at Brooks supplies that town with its requirements.

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. A field which has had considerable development since 1931 is the Onondaga, located in the Six Nations Indian Reserve, Tuscarora township, Brant county.

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 carry out systematic explorations and drillings during the non-winter months in order to maintain their 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, natural gas provides the third largest industry, and the market demand shows that the industry is steadily expanding. 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. The last twelve years experience and a study of the province's gas reserves has shown that the reserves are much greater than anticipated and the main distributing companies have prepared to serve their customers indefinitely.

In Saskatchewan, in 1934 natural gas was put to commercial use for the first time. A gas well, a mile north of Lloydminster, which got a large flow early in 1934, is now supplying the town of Lloydminster with gas. Several miles of gas mains have been laid in the town and a company has been granted a franchise to distribute gas. In other localities in Saskatchewan,

drilling tests were carried out. In the Dirt Hills area, 40 miles south of Moose Jaw, a test was carried to the limestone formation, a depth of over 4,000 feet. This is the deepest boring ever made in Saskatchewan. This well however was later abandoned after passing through three gas showings at higher levels. In the Pilot Butte and Hudson Bay Junction districts, exploratory drilling was also carried out with some showings of oil and gas in the well south of Hudson Bay Junction.

In Alberta, the Turner Valley field received the major activity and drilling work, with chief interest continuing in the south end. Some twelve new wells were started during 1934 and 3 or 4 reached production. Towards the end of the year, the gas allowance quota for wells in the Turner Valley was set by the Alberta Government at about 252 million cubic feet per day. During 1934, a second absorption plant was erected and came into operation in September. This plant handles gas from independent operators' wells and has a capacity of about 70 million cubic feet per day. Outside Turner Valley considerable drilling for oil and gas in the various unproved areas was carried on. Fields where drilling was done include Highwood, Hunter Valley, Aldersyde, and Pekisko hills in south central Alberta; and Watson, Del Bonita, Cardston, Lundbreck, and Comrey in southern Alberta. The Aldersyde well was the closest to production at the end of 1934 and it is expected that the well, if brought in during 1935, will open up a new producing field.

In British Columbia, drilling was continued at the well in the Sage Creek, Flathead district, and a well was spudded in at Boundary Bay, southeast of Ladner, near the site of an old well that struck gas several years ago. Further work is expected to be continued in 1935 at both these wells and possibly at the well near Cloverdale, south of New Westminster which had showings of gas in 1933.

Production and Trade

The province of Alberta continued in 1934 to lead the other provinces in the production of natural gas with a production of 14,000,000 M. cubic feet out of a total production of approximately 22,000,000 M. cubic feet for all of Canada. Ontario followed Alberta, with a production of 7,327,474 M. cubic feet, while New Brunswick came third with 607,000 M. cubic feet. Saskatchewan had its first recorded production in 1934, with a total of 13,781 M. cubic feet. Manitoba has been credited with a very small production each year since 1920.

A small amount of natural gas is imported each year from the United States, and is used for cooking, heating or illuminating. The importation in 1934 amounted to 101,171 M. cubic feet.

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PETROLEUM IN 1934

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 field. Other oil fields in Alberta which have produced crude oil in commercial quantities are the Ribstone and Skiff fields.

Ontario's chief oil field is the Petrolia-Oil Springs area, which has been in production since 1861. The Bothwell, Moza, and Dawn township fields are also important producers. The Brooke township field was quite active in 1934, and several producing wells were brought in at shallow depths.

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 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

The production of naphtha from the Turner Valley field in Alberta increased by about 25 per cent over that of 1933, due to the continued operation of the Royalite absorption plant, to the increasing care given to production technique, and to the completion of seven new naphtha-producing wells. A second absorption plant was started in September by independent producers, which, when working at full capacity, should add still further to the recovery of naphtha from the wet gas. Drilling activity was confined mostly to the south end of the Valley, particular attention being given to Section 28, Township 18, Range 2, west of the 5th Meridian. In the Wainwright field a marked increase in heavy crude production was noted due to the re-opening of several old wells. A remodelled and reconditioned refinery at Wainwright was in operation in 1934, and the problem of the disposal facilities for oil from present and future producing wells in the Wainwright field, it is hoped, has been solved for some time to come. Exploratory drilling for oil and gas in other fields outside the present producing localities in Alberta was quite active and about 19 wells were being drilled.

In Saskatchewan an interesting strike of a heavy crude oil was made in a well drilled near Hudson Bay Junction. Further drilling is expected in 1935, in the vicinity of this well, and drilling, it is also expected, will be continued at several other locations in Saskatchewan.

In British Columbia, drilling was continued at a well in Flathead valley, Sage Creek area, and the operators have been encouraged by showings of both oil and gas. Further drilling at this well, and at the well near Kelowna which also has had showings of crude, is expected in 1935.

In Alberta the outlook for the coming year is regarded as being very bright, and outside capital is becoming increasingly interested in the search for a major crude oil pool in that province. New deep tests in the various prospective areas in Alberta are expected during the year, and exploratory drilling in Manitoba, Saskatchewan, and British Columbia, is also expected to continue on a wider scale during 1935.

Expansion of refinery capacity was made in several existing refineries in both Eastern and Western Canada. The erection of several new refineries are announced on the island of Montreal, one of which is at present under construction. A small refinery at Midnapore, Alberta, started operations early in 1934, and it was recently announced that a new refinery is to be erected in Yorkton, Saskatchewan.

Canada's petroleum industry, like all major industries, is dependent on the solution of world-wide economic problems. Canada depends for her crude oil requirements on outside sources and thus affected by the major problems of the world's petroleum industry. Fortunately, the problems that have beset the oil industry in the United States, from whom Canada receives the bulk of her crude oil requirements, are to a great extent being solved.

Production and Trade

The total Canadian production, without regard to the specific gravities and grade of oil produced, is reported as 1,417,368 barrels, valued at $3,558,482; in the previous year the production was 1,145,333 barrels, valued at $3,138,791. Exports and imports being varied in character are shown in the following table:—

Exports:		
Oil, petroleum, crude	5,438 gal.	$ 497
Oil, coal and kerosene, refined	782,350 gal.	78,618
Oil, gasoline and naphtha	4,757,175 gal.	528,197
Oil, mineral, n.o.p.	12,994,817 gal.	585,785
Wax, mineral	2,633 cwt.	10,219
Total		$ 1,203,316
Imports:		
Petroleum	1,107,327,604 gal.	$33,250,541
Kerosene, fuel and illuminating oils	25,601,542 gal.	745,159
Lubricating oils	10,521,324 gal.	2,392,976
Gasoline and other oils	62,162,537 gal.	3,959,466
Asphaltum and other petroleum products		978,374
		$41,326,516

The 1934 records of petroleum production in Canada show an advance of 26 per cent in quantity and 20 per cent in value over 1933, and almost equalled the peak year of 1931.

An increase in the consumption of petroleum products in Canada was noted in 1934, and the sale of gasoline showed an increase over 1933, due partly to an increased tourist traffic and to the increased imports of crude petroleum, most of which goes into gasoline.

With greater industrial activity prevailing during 1934, the petroleum industry in Canada on the whole experienced a successful and more profitable year, and the prospects for a still further upward climb during 1935 appear bright. Motor car manufacturers have announced increased production plans and more motorists mean more consumers of oil and gasoline.

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