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**CANADA**

**DEPARTMENT OF TRADE AND COMMERCE**

**DOMINION BUREAU OF STATISTICS**

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**THE NON-FERROUS SMELTING**

**AND**

**REFINING INDUSTRY**

**IN**

**CANADA**

**1934**

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DEPARTMENT OF TRADE AND COMMERCE  
DOMINION BUREAU OF STATISTICS  
MINING, METALLURGICAL AND CHEMICAL BRANCH  
OTTAWA - CANADA

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THE NON-FERROUS SMELTING AND REFINING INDUSTRY IN CANADA, 1934.

Statistical data compiled from a survey conducted by the Mining, Metallurgical and Chemical Branch of the Dominion Bureau of Statistics at Ottawa reflect the very pronounced and almost general expansion realized throughout the Canadian non-ferrous smelting and refining industry in 1934. The estimated cost of ores, concentrates, etc., treated in smelters and refineries in 1934 totalled \$78,325,552 as compared with \$43,242,563 in 1933; value of primary products in metallurgical plants in 1934 amounted to \$149,936,239 as against \$100,561,297 and the total value added through the treatment of crude or semi-crude mine material in Canadian works totalled \$71,610,687, representing an increase of 24.9 per cent over the corresponding value of \$57,318,734 in 1933.

Employees in the industry totalled 8,298 in 1934 as compared with 6,360 in 1933, an increase of 30.5 per cent. Salaries and wages paid amounted to \$11,059,206 as against \$8,403,181 in the preceding year; the number of employees in 1934 was only surpassed in the history of the industry by those of 1929, a year of extensive mine and plant development.

The results of the survey of the non-ferrous metallurgical industry are particularly interesting in 1934 in that they include particulars relating to the purchase of mine and mill equipment, insurance costs, etc., and are the first of this nature compiled since 1923. The total value of such items as reported by the nickel-copper mines, smelters and refineries; copper-gold mines, smelters and refineries; silver-lead-zinc smelters and refineries, and cobalt-silver smelters totalled \$35,029,644 in 1934. Some of the outstanding values for expenditures during the last calendar year include \$6,272,642 for incoming freight, \$2,082,485 for outgoing freight, \$5,429,202 for fuel, \$1,472,833 for smelter fluxes, \$1,384,388 for lumber, \$958,387 for electrical equipment, and \$573,535 for flotation reagents.

REVIEW OF THE INDUSTRY BY PROVINCES.

QUEBEC - Aluminium ores are not mined in Canada; however, the production of primary metallic aluminium in Quebec, from imported material, has constituted an important industry for several years. The Aluminum Company of Canada, Limited, the sole producer of new metal in the Dominion, operated its Shawinigan Falls fabricating plant continuously throughout 1934; the company's reduction works at Shawinigan Falls was inactive. The reduction plant of the company located at Arvida maintained steady production of aluminium ingot during the last calendar year. This plant employed both imported alumina and aluminium produced at Arvida; the slag ore works was not operated in 1934.

"The Mining Journal", London reports the present capacity of the various aluminium reduction works of the United States of America, Canada, Scotland, Norway, France, Switzerland, Italy, Austria, Germany, Russia and Spain, could supply nearly 400,000 tons of virgin aluminium a year, and yet half a century ago barely 50 tons of this metal had been produced at a cost of roughly 30s. a pound. The price of the virgin metal is now quoted at about a shilling a pound, and this price has been more or less maintained since the slump period of 1921.

During 1934 the Noranda smelter treated 1,050,684 tons of copper-gold-silver ore, concentrate and refinery slag, and produced 70,607,764 pounds of anodes, the average analysis of which was 99.89% copper, 7.04 oz. gold per ton, and 15.66 oz. silver per ton. The following table shows the amount of material treated in the Noranda smelter and the production each year since commencement of operations:-

<u>Year</u>	<u>Tons of ore, con- centrate and re- finery slag smelted</u>	<u>Pounds of fine copper produced</u>	<u>Gold produced ounces</u>	<u>Silver produced ounces</u>
1927 .....	10,740	552,345	767	2,644
1928 .....	271,926	33,065,261	52,949	186,277
1929 .....	428,221	51,223,115	68,732	334,279
1930 .....	734,072	75,509,373	117,393	691,920
1931 .....	765,544	62,859,355	253,363	558,801
1932 .....	918,567	63,013,485	341,350	619,597
1933 .....	1,010,629	65,008,731	284,675	510,739
1934 .....	1,050,684	70,175,512	248,615	552,809

During 1934 the concentrator treated 920,363 tons of ore from the Horne mine, the average assay of which was 2.34% copper, 0.125 oz. gold per ton, and 0.32 oz. silver per ton, from which 181,938 tons of concentrate were produced and sent to the smelter. In April, 1934, the rated daily capacity of the concentrator was increased from 2,000 to 3,000 tons and at the same time additional equipment designed to regrind and retreat the entire mill tailing was placed in operation. This tailing retreatment plant is operating very satisfactorily and is effecting a substantial saving of gold that was formerly lost in the tailing. A hundred ton experimental cyanide unit designed to extract additional gold from the pyrite residue of the re-treated mill tailing was constructed and placed in operation in June, 1934. The results obtained from this unit were so satisfactory that a separate 500 ton cyanide mill to treat the entire pyrite portion of the tailing was constructed and placed in operation in 1935. The converter Cottrell plant was increased to twice its former size and capacity and the power house extended to accommodate a 2,600 k.w. steam turbine driven generator to be installed as an auxiliary source of power.

At Montreal East, the electrolytic copper refinery of Canadian Copper Refiners, Ltd., maintained steady production throughout 1934. Blister copper from Flin Flon, Manitoba, and anode copper from Noranda, Quebec, are treated in this plant for the production of refined copper, gold and silver; refined copper is marketed in the form of wire bars, ingot bars, and cathodes. Selenium is now being produced in substantial tonnage at the refinery; production of tellurium has been delayed as, owing to the demand for selenium, efforts were concentrated on the production of the latter metal; it is expected that tellurium will be produced in 1935.



ONTARIO -- The International Nickel Company of Canada, Limited, reported that operations throughout the year, conducted on an increased scale and at a uniform rate, afforded the management opportunity to cut costs of production to the lowest figures obtaining since the plants were reconstructed and the Frood mine fully developed. The expanded operations called for additions to payrolls and decreased unemployment in the various localities in which operations were conducted. The concentrator of the company was operated at a uniform rate during 1934 and treated 1,843,146 tons of ore, the greatest tonnage thus far handled. As the result of certain re-arrangement of equipment and with the completion of some minor installations the available capacity in the grinding and flotation sections is 8,000 tons per day. This capacity can be readily increased to 11,000 tons per day should demand call for increased quantities of nickel. The Copper Cliff smelter produced 92,174 tons of bessemer matte and 97,611 tons of blister copper. Three reverberatory furnaces were in operation throughout the year. The installation of additional converters was completed; this not only adds to plant capacity, but from a metallurgical standpoint balances adequately the copper and nickel smelting operations. For the Orford separation process one blast furnace was used in 1934 and a second for seven months. At the Coniston smelter three blast furnaces were in operation up to April 1st and four thereafter; during the year 840,980 tons of ore were smelted and 59,732 tons of bessemer matte produced. All of the four hydro-electric plants were in use throughout the year.

At the Port Colborne nickel refinery six electrolytic circuits were in continuous operation during the year and a seventh was in use from April to August inclusive. The total output of nickel, inclusive of nickel in oxide, was 70,974,850 pounds.

The electrolytic copper refinery of the Ontario Refining Company, Limited, (90% owned by the International Nickel Company of Canada, Limited), maintained steady production at Copper Cliff, Ontario, throughout 1934. As a result of increased nickel production there was a corresponding increase in the tonnage of blister copper received from the Copper Cliff smelter, which rose from approximately 6,500 tons per month at the beginning of the year to 9,000 tons per month during the last quarter. Refined copper production amounted to 95,558 tons compared with 58,098 tons in 1933. Shipments from the refinery were 97,292 tons in 1934 compared with 53,678 tons in 1933. Selenium and tellurium are now regularly produced as by-products in addition to by-product gold, silver and platinum metals. A plant for refining tellurium was constructed during the year and was started in October, 1934. Selenium has found its best use as a decolorizer and as a base for various colors in the manufacture of glass. An interesting application is found in the photo-electric cell. Tellurium is used as a hardening and strengthening agent in lead and its alloys.

In the manufacture of rubber products strength and resistance to abrasion are improved by the use of selenium and tellurium.

The mill and smelter of Falconbridge Nickel Mines, Limited, operated throughout 1934 with only the normal interruptions for repairs and the excellent overall metallurgical recovery was reported as slightly improved. No important changes occurred during the year in the milling and smelting plants. It was rather a year of crowding the existing facilities to their utmost with the result that 272,923 tons were treated or 17 per cent more than the previous year. Results of operations are tabulated as follows:-

Total ore treated .....	272,923 tons
Matte produced .....	9,271.4 short tons
Nickel in matte produced .....	5,202.6 short tons
Copper in matte produced .....	2,450.8 short tons
Metals per ton in ore .....	41.00 lbs. nickel and 19.90 lbs. copper
Metallurgical losses per ton of ore ..	2.88 lbs. nickel and 1.94 lbs. copper

From 317,646 tons of ore delivered to the crushing plant 44,116 tons or 13.9 per cent of waste was eliminated by sorting and discarded.

The plants of the Deloro Smelting and Refining Company, Limited, located at Deloro, Hastings county, were operated continuously during 1934. Silver-cobalt ores from the Cobalt and Gowganda areas were treated by the company for the production of silver bullion, white arsenic, cobalt metal, cobalt oxides and salts, and nickel oxide. A silver-lead-bismuth bullion was also exported by the company.

It is interesting to note, that according to a statement by Sir Edmund Davis, 1,217,925 pounds of by-product cobalt were recovered for the fourteen months to the end of August, 1934, from ore on the Mindola section of Rhokana in Northern Rhodesia and Union Miniere du Haut-Katanga have announced that the cobalt market developed substantially in 1934, the tonnage of its sales being heavier than for any previous year.

At Port Hope the radium refinery of Eldorado Gold Mines, Limited, was in continuous operation during 1934. Silver-pitchblende ores and concentrates from Great Bear Lake, North West Territories, were treated in this plant and products included radium salts, sodium uranate (orange), sodium uranate (yellow), uranium oxide (black), uranium salts, and by-product silver and lead. During 1934 the plant was reported to have received from the mine 77 tons of pitchblende and silver ore and 7 tons of silver concentrates. Twenty-six tons of ore were treated during the year with recovery of radium, uranium, silver and lead amounting to \$210,000, leaving 48 tons of roasted ore on hand at December 31, 1934. During the period January 1, 1935, to May 31, 1935, the remaining 48 tons of ore were treated with recovery amounting to \$250,000, in addition to which there remained in the plant in process about \$135,000 in products. Radium has been supplied to the following countries: England, Ireland, Scotland, United States, South Africa, Egypt, Iraq, Cyprus, Esthonia, Australia and Canada.

MANITOBA AND SASKATCHEWAN - The Flin Flon mine, copper smelter and zinc refinery are situated on the interprovincial boundary of Manitoba and Saskatchewan, and for this reason, the operations of the Hudson Bay Mining and Smelting Company, Limited, are reviewed under the heading of the two provinces.

There was treated by the concentrator during 1934 an average daily tonnage during the days the plant operated of 4,420 tons or a total for the eleven months operated during the year of 1,463,716 tons of ore. This averaged gold, ounces .095; silver, ounces 1.45; copper, 1.71 per cent, and zinc, 4.4 per cent. The tonnage treated was approximately the same as that treated during the previous year. From the 1934 tonnage there were produced 250,595 tons of copper concentrates assaying gold, ounces 0.353; silver, ounces 5.16; copper, 8.29 per cent, and 76,149 tons of zinc concentrates assaying gold, .071 ounces; silver, 1.90 ounces; copper, 0.87 per cent, and zinc, 45.5 per cent.

The operation of the cyanide annex continued with minor changes, all of which tended towards improving the operations. A maximum tonnage of 921,388 was put through this plant; this consisted of sulphide ore tailings averaging .0417 oz. gold per ton and .605 ounces of silver per ton.



The copper smelter was operated continuously during the year with the exception of the strike period. There were smelted in the reverberatory in 1934, 245,425 tons of Flin Flon ore and concentrates; from the Flin Flon concentrates and other products there were produced and shipped 19,101 tons of blister copper containing a total of 99,334 ounces gold, 1,348,807 ounces of silver, and 37,677,064 pounds of copper. The average tonnage of new material treated per day by the smelter was 828 tons.

The electrolytic zinc plant operated steadily throughout 1934 with the exception of June, the strike month. There was treated during the year 72,896 tons of zinc concentrates averaging gold, .070 ounces; silver, 1.89 ounces; copper, 0.89 per cent, and zinc, 45.5 per cent, from which were produced 49,427,280 pounds of zinc the average grade of which was 99.9893 per cent zinc. In 1934 the refinery produced 647 tons of die casting zinc averaging 99.9919 per cent zinc. The amount of cadmium precipitate in stock at the close of 1934 totalled 5,495 tons, the metal content of which is cadmium, 3.63 per cent, copper, 6.76 per cent, and zinc, 55.0 per cent.

BRITISH COLUMBIA - The Consolidated Mining and Smelting Company of Canada, Limited, reported that the cost of producing lead and zinc was again the lowest in the history of the company. Cost reductions in 1934 were due largely to the enhancement in the value of silver (silver values being credited against the cost of lead and zinc) and to the increased tonnages handled.

Concentration costs at the Kimberley concentrator were slightly above the record of 1933. Recoveries, while good in comparison with all other years, were a little below those of 1933. The drop in recoveries is ascribed partly to the larger tonnage treated, 25 per cent over 1933, and partly to the oxidation due to sprinkling the ore to control the dust. The small increase in mining and concentrating costs was much more than offset by the increased value of silver, with the result that the cost of both lead and zinc in concentrates constituted an all time low record.

The 1933 record costs of smelting lead were maintained in 1934. Lead losses were a little higher owing to smelting a large tonnage of Rossland ore in the lead plant, the available tonnage of this ore not being sufficient to run a copper furnace.

Record costs and recoveries were made in the zinc plant; the reduction in cost was mainly due to larger tonnage and to the new roasting process. The cadmium and bismuth plants, both by-product works, are only run as occasion demands.

Following is the metal production and tonnage treated at Kimberley and Trail plants together, from 1894 to date, and for 1934:-

	<u>Tons ore treated</u>	<u>Gold produced ounces</u>	<u>Silver produced ounces</u>
1894 to date .....	24,463,646	2,381,581	113,951,029
1934 .....	1,792,298	35,328	7,316,231
	<u>Lead produced pounds</u>	<u>Copper produced pounds</u>	<u>Zinc produced pounds</u>
1894 to date .....	3,797,121,176	184,673,769	2,020,575,232
1934 .....	315,346,312	1,567,078	221,955,701

	<u>Cadmium produced pounds</u>	<u>Bismuth produced pounds</u>	<u>Fertilizer tons</u>
1894 to date .....	2,650,668	576,871	237,706
1934 .....	293,611	246,092	82,497

The plants of Granby Consolidated Mining, Smelting and Power Company, Limited, located at Anyox consist of a crushing plant and concentrator of about 5,000 tons capacity, smelter, coke ovens and power plant. During 1934 the continued low copper price adversely affected the Granby operations at Anyox and the bulk of the blister output was necessarily stored. A generally lower tenor of ore was met by a slight increase in tonnage to the mill, which, towards the end of the year, was treating about 5,200 tons of ore per day. No new ore developments of importance materialized in the mine during the year. In the early part of December a blast involving 500,000 or more tons of ore, mainly in pillars and sills of old stopes in No. 1 and No. 5 orebodies between the 385 foot level and surface, was carried out. About 1,100 men were employed at Anyox with a payroll of \$135,000 per month. Mining operations of the company were discontinued in July, 1935. "The Miner", Vancouver, comments on Granby as follows: "The operating efficiency that distinguished the first, or boundary, stage of the Granby undertaking, has been more than duplicated in the last stage at Anyox, and during the past few years in particular. Indeed, in point of low cost production of copper, we question if any mine in the world, where the conditions are similar, can show comparable results with Granby. This has meant, that although during the depression period, with the world price of copper falling below six cents a pound, the company has continued to operate, - not without loss, it is true, - but nevertheless to operate. Corporations are supposed to be soulless, but it is difficult, as we have previously noted, to discover motives other than primarily benevolent to its employees and their community in the company's policy since 1933 of continuing to produce copper for accumulation when metal could have been purchased in the open market at a price considerably below the cost of production at Anyox .... actually the Anyox orebodies, commercially considered, were depleted three years ago....."

It is noteworthy that the new electrolytic copper refinery erected at the Nakana smelter in Northern Rhodesia put its anode department into operation in September, 1934; the first cathode section was put into circuit on December 4th and the first cathode production was drawn on December 21st. The new refinery consists essentially of an anode department, making anodes of refined blister copper, an electrolytic tank house, which converts the anodes into cathodes by electro-deposition, and a furnace refinery which melts and casts the cathodes into commercial shapes. Necessary installations auxiliary to these are the electric sub-station and slimes treatment plant. The rated capacity of the refinery as built is 36,500 short tons of refined copper output per year, but the site chosen will allow for extension to five times its present capacity when desired. Nakana blister copper is of exceptional purity containing about 99.5 per cent copper.



PRINCIPAL STATISTICS OF THE NON-FERROUS METALLURGICAL INDUSTRY IN CANADA, 1933 and 1934.

	1933	1934
Number of companies .....	11	11
Number of plants .....	14	14
Capital employed .....	\$ 146,085,284	146,047,422
Number of salaried employees .....	679	849
Salaries .....	\$ 1,461,380	1,842,449
Number of wage-earners .....	5,681	7,449
Wages .....	\$ 6,941,801	9,216,757
Cost of fuel and electricity .....	\$ 7,809,936	10,477,562
Estimated cost of ores, concentrates, etc., treated .....	\$ 43,242,563	78,325,552
Value of plant products .....	\$ 100,561,297	149,936,239
Value added by smelting .....	\$ 57,318,734	71,610,687

NUMBER OF WAGE-EARNERS, BY MONTHS, 1932, 1933 and 1934.

Month	1932	1933	1934
January .....	5,496	5,003	6,870
February .....	5,400	4,831	6,832
March .....	5,355	4,926	7,034
April .....	4,750	4,890	7,264
May .....	4,297	4,910	7,530
June .....	4,475	5,534	7,717
July .....	4,205	6,080	7,734
August .....	4,160	6,322	7,767
September .....	4,198	6,368	7,595
October .....	4,326	6,478	7,816
November .....	4,316	6,396	7,620
December .....	4,274	6,410	7,606
AVERAGE .....	4,604	5,681	7,449

FUEL AND ELECTRICITY USED IN THE NON-FERROUS SMELTING AND REFINING INDUSTRY, 1933.

KIND	Unit of measure	For heat and power		For metallurgical purposes	
		Quantity	Cost	Quantity	Cost
Bituminous coal - Canadian .....	tons	4,315	23,550	244,701	1,657,991
Imported .....	tons	16,120	88,448	109,006	578,272
Anthracite .....	tons	84	957	...	...
Coke .....	tons	1,783	16,528	129,605	1,165,432
Gasoline (exclusive of that used in motor cars) .....	Imp.gal.	29,541	5,653	...	...
Fuel oil and diesel oil .....	Imp.gal.	3,078,478	114,325	7,218,294	327,775
Kerosene or coal oil .....	Imp.gal.	4,395	948	...	...
Wood (cords of 128 cubic feet) ..	cords	160	657	5,489	28,963
Gas - Manufactured .....	M cu.ft.	127,372	14,011	45,886	4,998
Natural .....	M cu.ft.	79	69	...	...
Other fuel .....	xxx	...	5,098	...	22,079
Electricity purchased .....	K.W.H.	833,473,571	2,522,078	380,331,833	1,232,104
TOTAL .....	xxx	...	2,792,322	...	5,017,614
Electricity generated for own use K.W.H. ....			15,442,203		

FUEL AND ELECTRICITY USED IN THE NON-FERROUS SMELTING AND REFINING INDUSTRY, 1934.

Kind	Unit of measure	For heat and power		For metallurgical purposes	
		Quantity	Cost	Quantity	Cost
			\$		\$
Bituminous coal - Canadian .....	tons	3,315	15,374	370,362	2,320,909
Imported .....	tons	20,131	113,051	50,493	299,398
Anthracite .....	tons	58	889	...	...
Coke .....	tons	2,371	25,506	261,897	2,476,281
Gasoline (exclusive of that used in motor cars) .....	Imp.gal.	47,393	10,133	713	210
Fuel oil and diesel oil ....	Imp.gal.	2,741,880	121,952	9,894,420	554,779
Kerosene or coal oil .....	Imp.gal.	7,089	1,539	399	89
Wood (cords of 128 cubic feet) cords		69	344	4,662	26,721
Gas - Manufactured .....	M cu.ft.	92,035	11,320	50,418	5,848
Natural .....	M cu.ft.	152	122	...	...
Other fuel .....	xx	...	8,852	...	30,898
Electricity purchased .....	K.W.H.	1,077,755,407	3,255,630	411,073,814	1,197,717
TOTAL .....	xxx	...	3,564,712	...	6,912,850
Electricity generated for own use .....	K.W.H.	...	20,251,795	...	...

POWER EMPLOYED IN THE NON-FERROUS SMELTING AND REFINING INDUSTRY, 1933 and 1934.

Kind	1933		1934	
	Number of units	Total horse power	Number of units	Total horse power
Steam engines and steam turbines .....	32	16,542	34	16,556
Gasoline, gas and oil engines .....	11	348	15	543
Hydraulic turbines or water wheels ...	21	65,160	10	14,035
Electric motors operated by purchased power .....	4,265	232,021	5,003	247,889
Electric motors operated by company's power .....	832	16,556	846	16,750
Boilers .....	48	25,459	50	25,701

METAL PRICES, 1929-1933.

Metal	Market	Unit of measure	1930	1931	1932	1933	1934
			\$	\$	\$	\$	\$
Arsenic .....	New York	Pound	0.04	0.045	0.04	0.04	0.04
Cobalt .....	New York	Pound	2.50	2.50	2.50	2.50	2.50
Cobalt oxide ..	New York	Pound	2.00	1.75	1.35	1.35	1.35
Copper .....	New York	Pound	0.1298	0.0837(x)	0.05555	0.07025	0.08428
Copper .....	London	Pound	...	...	0.06380(x)	0.074548(x)	0.074193(x)
Lead .....	London	Pound	0.0392	0.2710(x)	0.0211(x)	0.023916(x)	0.024364(x)
Silver .....	New York	Ounce	0.3815	0.2987(x)	0.3167(x)	0.378328(x)	0.474609(x)
Zinc .....	London	Pound	0.0360	0.0255(x)	0.0240(x)	0.032105(x)	0.030436(x)

(x) Canadian funds.



**PURCHASES OF EQUIPMENT AND GENERAL SUPPLIES, TOGETHER WITH COST OF INSURANCE, FREIGHT, ETC., in the CANADIAN NON-FERROUS SMELTING AND REFINING INDUSTRY DURING 1934.(x)**

	Value, f.o.b. plant \$
Belting of all kinds, including elevator, conveyor, transmission, etc., and fasteners for same .....	113,153
Bolts, nuts, rivets, studs, washers, coach, set and machine screws, etc. ....	160,401
Castings:- unfinished iron and steel .....	134,091
Unfinished brass castings; brass and copper rods and sheets, babbitt and non-ferrous metals of all kinds .....	419,687
Cars and locomotives and mechanical parts for same .....	209,928
Track materials:- rails and fittings, switches, spikes, bolts, etc. ....	203,517
Explosives:- powder, fuse and detonators .....	1,495,097
Rock drills and parts .....	309,830
Drill and tool steels.....	180,041
Pipe and fittings, plumbing supplies and valves .....	484,090
Iron and steel bars, sheets, plates, and all structural steel .....	953,763
Wire rope and fittings .....	138,562
Diamonds and bort for drilling .....	16,900
Safety equipment and apparel:- safety hats, boots, gloves, goggles, respirators, etc.; miners' lamps and accessories and lamp rentals ....	241,683
Fuel:- coal, coke, charcoal and wood .....	5,429,202
Fuel oil, kerosene, and gasoline .....	780,651
Lubricants:- oil, grease and waste .....	175,399
Lumber and timber of all kinds .....	1,384,388
Building materials:- cement, brick, tile, roofing and building paper, insulating material, building hardware, glass, putty, paints, varnishes and brushes, wood screws, nails, screw hooks and eyes, sand, lime, and miscellaneous .....	530,385
Electrical equipment and supplies:- motors, batteries, wire and cable, etc. ....	958,387
Crushing, grinding and screening machinery and parts: ball and tube mill liners, roll shells, etc. ....	424,882
Filter cloth, rotor covers and ore dressing blankets .....	121,115
Balls and rods for grinding .....	315,987
Machinery, mill, n.o.p. and parts .....	279,403
Machinery, mine, n.o.p. and parts:- steel shop equipment, hoists, mine pumps, etc. ....	382,266
Machinery, smelter, n.o.p. and parts .....	724,668
Machinery, miscellaneous, and parts: machine, blacksmith, carpenter shop and general surface equipment.....	438,236
Motor cars, trucks and accessories .....	97,157
Tools:- brooms, picks, shovels, hammers, handles, saws, wrenches, machinists' tools, etc. ....	273,346
Welding and cutting equipment and accessories:- oxygen, acetylene welding, rods, tips, etc. ....	112,778
Rubber goods, suits, boots, hose and accessories, pump valves, launder linings, etc. (not including belts) .....	220,157
Flotation reagents .....	573,535
Cyanide and cyanide plant chemicals .....	137,663
Acids and chemicals, n.o.p. ....	273,781
Refractories:- brick, cement, fireclay, etc. ....	784,359
Smelter fluxes:- fluorspar, limestone, quartz, sand, etc. ....	1,472,833
Hospital equipment and medical supplies .....	22,276
Stationery, office equipment and supplies, survey and drafting equipment and supplies .....	98,068

PURCHASES OF EQUIPMENT AND GENERAL SUPPLIES, TOGETHER WITH COST OF INSURANCE, FREIGHT, ETC., in the CANADIAN NON-FERROUS SMELTING AND REFINING INDUSTRY DURING 1934(x).  
(concluded)

	Value, f.o.b. plant \$
Miscellaneous materials, n.o.p. (includes all materials not otherwise provided for in any other item) .....	1,120,676
Power - electric .....	3,740,221
Freight (a) incoming - only amounts paid direct to Railway Company .....	6,272,642
(b) outgoing .....	2,082,485
Express (a) incoming - only amounts paid direct to Express Company .....	24,991
(b) outgoing .....	30,923
Insurance (a) Fire .....	146,562
(b) Sickness and accident .....	1,925
(c) Group .....	45,277
(d) Workmen's compensation .....	398,412
(e) Bullion .....	6,107
(f) Other .....	87,760
TOTAL .....	35,029,644

(x) Owing to the difficulty of segregating certain data, the figures of purchases, etc., by nickel-copper and copper-gold-silver mines are included in the above.

CAPACITIES OF CANADIAN COPPER SMELTING AND REFINING WORKS, 1934 (x)

Company	BLAST FURNACES		REVERBERATORIES		CONVERTERS	
	Number	Annual Capacity-tons of ore and concentrates	Number	Annual Capacity-tons of ore and concentrates	Number	Annual Capacity-tons of ore and concentrates
Consolidated Mining & Smelting Co. (b) ...	...	...	1	48,000	2	16,000
Falconbridge Nickel Mines .....	1	200,000	...	...	2	35,000
Granby Consolidated Mining, Smelting & Power Co. ....	2	200,000	...	...	3	15,000
Hudson Bay Mining & Smelting Co. ....	...	...	1	325,000	2	...
Noranda Mines .....	...	...	2	900,000	4	150,000
International Nickel Co. ....	4	800,000	5	2,100,000	17	...

(x) American Bureau of Metal Statistics.  
(b) Idle.

ELECTROLYTIC COPPER REFINERIES

Annual Capacity - short tons

Canadian Copper Refiners Ltd.	65,000
Ontario Refining Co. Ltd.	120,000



COPPER PRODUCTION OF THE WORLD ON SMELTERY BASIS, (a), 1929, 1932,  
1933 and 1934.

(Taken from the 1934 Year Book of the American Bureau of Metal Statistics)  
(in tons of 2,000 lb.)

	1929	1932	1933	1934
United States(x) .....	1,179,269	309,160	284,172	314,198
Whereof from scrap .....	47,628	18,183	25,284	52,754
Whereof from foreign ore .....	105,293	35,468	25,239	29,145
Mexico .....	63,795	37,440	43,642	51,903
Canada .....	79,186	106,050	129,763	168,203
Chile .....	333,296	107,242	173,057	271,589
Peru .....	59,527	22,910	27,068	29,997
Austria .....	4,293	1,703	808	500
Germany .....	59,083	56,107	54,895	58,422
Great Britain .....	14,440	8,267	8,818	10,362
Jugoslavia .....	22,790	33,244	44,154	48,909
Norway .....	2,633	5,937	7,341	8,926
Russia .....	28,443	33,816	36,034	48,587
Spain .....	22,215	9,998	9,947	7,716
Sweden .....	5,271	7,016	9,643	8,747
Other Europe .....	10,498	5,658	3,000	3,000
Japan .....	83,189	68,100	67,000	66,100
India .....	1,976	4,976	5,376	7,054
Other Asia .....	2,000	1,000	1,000	1,000
Australasia .....	13,907	16,472	16,539	12,355
Africa .....	159,250	145,931	200,430	291,525
Whereof, Belgian Congo .....	...	59,522	73,409	123,458
Whereof, Rhodesia .....	...	75,403	117,800	160,501
Totals .....	2,145,061	981,027	1,122,687	1,410,093
Deduct U. S. secondary .....	47,628	18,183	25,284	52,754
Total new copper .....	2,097,433	962,844	1,097,403	1,357,339

(a) The above table gives only the copper that is smelted, including direct production by electrolysis, and does not break down to origin back of the place of beneficiation; every effort has been made to eliminate secondary copper so far as possible. The production of Japan is reported as blister copper beginning with 1932; previously as refined copper, which includes a certain quantity of secondary. The entire production of Katanga is credited to Belgian Congo, irrespective of where smelted.

(x) The United States Bureau of Mines reports the smelter production of primary copper from domestic sources in the United States during 1934 at 488,454,107 pounds, an increase of approximately 9 per cent. The value of smelter production increased approximately 36 per cent in 1934. The average price of copper delivered during the year, as reported to the Bureau of Mines by selling agencies, was 8.0 cents a pound, f.o.b. refinery. The total production of new refined copper in 1934 was 891,000,000 pounds, an increase of 149,000,000 pounds or 20 per cent over that in 1933. In addition to their output of metallic copper, the regular refining companies produced bluestone (hydrous copper sulphate) having a copper content of 6,333,000 pounds, as compared with 6,479,000 pounds in 1933.

LEAD SMELTING CAPACITY OF CANADA

Company	Situation of plant	Number of blast furnaces	Annual Capacity (tons of charge)
Consolidated Mining & Smelting Co.	Trail, B.C.	5	700,000

WORLD PRODUCTION OF LEAD(a)  
(short tons)

Country	1922	1929	1931	1932	1933	1934
North America .....	649,022	1,121,394	796,202	560,727	562,213	687,515
South America .....	6,547	34,038	14,992	15,306	12,617	10,692
Total Europe .....	314,647	458,279	442,795	412,165	403,966	445,412
Total Asia .....	53,441	100,743	88,871	86,819	88,216	88,941
Australia .....	118,064	195,403	171,607	208,577	233,532	226,336
Africa .....	37,419	22,663	21,067	15,523	16,395	30,105
GRAND TOTAL .	1,179,140	1,932,520	1,535,534	1,299,117	1,316,939	1,489,001

(a) In general, output is reported in terms of base bullion allocated as far as possible to origin of ore, according to the American Bureau of Metal Statistics.

Of the output recorded for North America in 1934, Canada contributed 159,833 short tons, excluding lead exported to European countries, the corresponding figure for 1933 was 129,932 short tons.

The American Bureau of Metal Statistics estimates that the lead refining capacity of the world aggregates about 1,042,000 short tons in the United States and about 1,945,000 tons elsewhere, a grand total of 2,987,000 tons. However, probably not more than 900,000 tons in the United States and 1,450,000 tons elsewhere, a grand total of 2,350,000 tons, is to be rated as useful and effective, the remainder being obsolete, incapable of economical ore supply, or otherwise useless.

CAPACITY AND PRODUCTION OF ELECTROLYTIC ZINC PLANTS IN CANADA, 1932 - 1934.

	Maximum H.P. used	Estimated annual capacity for cathode zinc (short tons)	Actual production as ingot zinc (short tons)		
			1932	1933	1934
Consolidated Mining & Smelting Co. of Canada, Ltd. ....	73,000	146,000	65,284	68,810	110,217
Hudson Bay Mining & Smelting Co. Ltd. ....	13,500	23,400	20,868	23,153	24,714

Supplied by the American Bureau of Metal Statistics.



WORLD PRODUCTION OF ZINC(a), 1929, 1933 and 1934.

(Supplied by the American Bureau of Metal Statistics)

(in short tons - 2,000 lb.)

Country	1 9 2 9	1 9 3 3	1 9 3 4
United States .....	631,601	324,705	366,933
Mexico .....	29,954	30,712	40,354
Canada .....	86,049	91,227	134,926
Belgium .....	218,145	151,346	192,885
Czechoslovakia .....	12,604	7,480	9,773
France .....	100,984	61,217	56,410
Germany .....	112,435	56,071	80,358
Great Britain .....	65,294	45,987	57,344
Italy .....	17,421	24,504	26,921
Jugoslavia .....	8,061	3,369	4,450
Netherlands .....	28,342	20,368	21,948
Norway .....	6,080	49,546	49,604
Poland .....	186,324	93,397	102,522
Russia .....	3,789	18,320	29,823
Spain .....	13,035	9,421	9,016
Sweden .....	5,201	...	...
Australia .....	56,001	60,425	59,353
Japan .....	21,807	32,537	32,518
French Indo-China .....	4,196	3,472	4,575
Rhodesia .....	13,575	20,767	21,882
TOTAL .....	1,620,898	1,104,871	1,301,595

(a) The statistics in this table are the summaries of production as made by the metallurgical works of the world whose principal business is the reduction of ore. Insofar as they produce slab zinc from secondary material such is included. The quantity of such inclusion is, however, relatively small. Production is not allocated according to the origin of the ore except in the instances of the United States and Mexico beginning 1929. Slab zinc produced in the United States from Mexican ore has been separated and credited to Mexico in that year and subsequently. Other production from Mexican ore is included in figures of countries where treated.

The American Bureau of Metal Statistics estimates the capacity of American zinc metallurgical works at the end of 1934 as being nominally for the production of 700,000 short tons of spelter per annum by distilling and 231,000 tons by electrolysis, a total of 931,000 tons, the same as at the end of 1931, but the first class effective capacity is something less, probably not more than for 850,000 tons, and perhaps materially less than that. It is estimated that the effective capacity outside of the United States at the end of 1934 was 1,150,000 metric tons whereof about 275,000 tons was in Australia, Canada and Mexico, and about 875,000 tons elsewhere. New plants both electrolytic and distilling, were built in 1934, but their effect was largely to displace previous capacity.

WORLD PRODUCTION OF ALUMINIUM

(Supplied by the American Bureau of Metal Statistics)  
(in metric tons)

Country	1922	1929	1931	1932	1933	1934
United States .....	33,600	102,100	80,500	47,600	38,600	33,646
Canada .....	10,000	42,000	31,000	18,000	16,200	15,500
Europe .....	48,200	137,898	107,635	87,454	86,742	119,958
TOTAL FOR WORLD .....	91,800	281,998	219,135	153,054	141,542	169,104

Omitted from this table are possibly small productions in Belgium and Japan, as to which information is uncertain.

WORLD PRODUCTION OF NICKEL ORE, 1932-1934(a)  
(in terms of metal)

Country	1932	1933	1934
	(short tons)		
Canada (b) .....	15,164	41,632	64,344
New Caledonia (c) .....	3,200	4,900	5,500
Greece .....	1,053	1,344	(e)
India (d) .....	1,042	1,090	1,300
Norway .....	1,042	1,096	(e)
Russia .....	...	...	951

(a) Production outside of these countries is very small.

(b) Production in all forms from Canadian ores, as reported by Ontario Bureau of Mines.

(c) Exports of matte; content, estimated at 75%.

(d) Nickel content of speiss obtained as a by-product.

(e) Data not yet available.

DIRECTORY

CANADIAN COPPER SMELTING COMPANIES, 1934.

<u>Name</u>	<u>Head Office Address</u>	<u>Plant Location</u>
Noranda Mines Ltd.	2 King St. E., Toronto, Ont.	Noranda, P.Q.
(a) International Nickel Co. of Canada, Ltd.	67 Wall St., New York City, U.S.A.	Copper Cliff, Port Colborne and Coniston, Ont.
(a) Falconbridge Nickel Mines Ltd.	25 King St. W., Toronto, Ont.	Falconbridge, Ont.
Hudson Bay Mining & Smelting Co., Ltd.	404 Dundas St., Woodstock, Ont.	Flin Flon, Man.
Granby Consolidated Mining, Smelting & Power Co. Ltd.	789 Pender St. W., Vancouver, B.C.	Anyox, B.C.
(a) Smelt nickel-copper ores.		



DIRECTORY (concluded)

CANADIAN ELECTROLYTIC COPPER REFINING COMPANIES, 1934.

<u>Name</u>	<u>Head Office Address</u>	<u>Plant Location</u>
Canadian Copper Refiners Ltd.	2 King St. E., Toronto, Ont.	Montreal East, P.Q.
Ontario Refining Co. Ltd.	Copper Cliff, Ont.	Copper Cliff, Ont.

CANADIAN LEAD SMELTING AND REFINING COMPANIES, 1934.

Consolidated Mining and Smelting Co. of Canada Ltd. (f)	Dominion Square Bldg., Montreal, P.Q.	Trail, B.C.
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CANADIAN ELECTROLYTIC ZINC REFINING COMPANIES, 1934(x)

Consolidated Mining and Smelting Co. of Canada, Ltd.	Dominion Square Bldg., Montreal, P.Q.	Trail, B.C.
Hudson Bay Mining and Smelting Co. Ltd.	404 Dundas St., Woodstock, Ont.	Flin Flon, Man.

CANADIAN SMELTERS AND REFINERS OF COBALT-SILVER-ARSENIC ORES, 1934.

Deloro Smelting and Refining Co. Ltd. (f)	Deloro, Ont.	Deloro, Ont.
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CANADIAN REFINERS OF URANIUM-RADIUM ORES, 1934.

Eldorado Gold Mines Ltd.	Star Bldg., Toronto, Ont.	Port Hope, Ont.
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CANADIAN PRODUCERS OF PRIMARY ALUMINIUM, 1934.

Aluminum Company of Canada, Ltd.	Canada Life Bldg., Toronto, Ont.	Arvida and Shawinigan Falls, P.Q.
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- (f) Produce bismuth or bismuth-bearing bullion as by-products.  
(x) Produce cadmium or cadmium compounds as by-products.







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