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CANADA

DEPARTMENT OF TRADE AND COMMERCE

DOMINION BUREAU OF STATISTICS

CENSUS OF INDUSTRY

MINING, METALLURGICAL & CHEMICAL BRANCH

THE NON-FERROUS SMELTING

AND

REFINING INDUSTRY

IN

CANADA

1936

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DOMINION BUREAU OF STATISTICS
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THE NON-FERROUS SMELTING AND REFINING INDUSTRY IN CANADA, 1936.

Finally revised statistical data relating to operations conducted by the non-ferrous metallurgical industries in Canada during 1936 distinctly reflect the recent and large increase in the production of refined non-ferrous metals and primary metal products in the smelters and refineries of the Dominion.

The gross value of all products totalled \$229,737,420 in 1936 as compared with \$186,245,658 in 1935, or an increase of 23.3 per cent. Refined products included gold, silver, copper, lead, zinc, aluminium, cobalt, cadmium, selenium, tellurium, radium salts, uranium compounds, bismuth and sulphur; other end products of individual plants or companies included copper-nickel matte, cobalt and nickel salts and oxides, arsenious oxide, sulphur in sulphuric acid, platinum metals residues, and blister and anode copper.

The estimated cost of ores, concentrates and other material treated during 1936 was \$137,857,432; fuels and purchased electricity consumed totalled \$12,613,763; chemicals and various other process supplies used amounted to \$7,989,580, and the net value of production or value added by processing was estimated at \$71,276,645, or an increase of 19.9 per cent above that of the preceding year.

Capital employed in 1936 by the combined firms comprising the industry totalled \$143,858,717; 10,015 employees were reported and \$14,346,050 distributed in salaries and wages.

Among the world producers of copper on a smelting and mine basis, Canada ranked third in 1936, being surpassed only by the United States and Chile. Preliminary data for the same year indicate that the Dominion is now the world's fourth largest producer of the metal in the refined state.

Allocated according to origin of ore, Canada, in 1936, was the fourth largest world producer of lead in the form of base bullion, the output of the Canadian industry being exceeded, in the order of their magnitude only by those of the United States, Mexico and Australia.

As a world producer of metallic zinc Canada was credited in 1936 with third position, the United States and Belgium being the two leading nations engaged in the reduction of zinc ores; the Dominion, however, ranks second in world importance as a producer of the metal from domestic ores.

According to the Internal Trade Branch of the Bureau, base metals security prices gained more consistently in 1936 than any other group, rising from 214.8 in January to 241.1 for April (1926=100). Then, after a minor decline to 239.2, they advanced without interruption to 317.8 for December. Spectacular increases in base metal commodity prices, particularly in the final quarter, furnished considerable support for improvement in base metal stock prices. Gains of the latter, however, were approximately three times as great as those for commodity prices.

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REVIEW OF THE INDUSTRY BY PROVINCES

QUEBEC - The Aluminium Company of Canada Limited made an important extension to its plant at Arvida; this was for the extraction of alumina from bauxite by the "Bayer" process. In 1936 it was reported that Demerara bauxite from British Guiana is now used at the Arvida plant, the mineral being shipped direct from MacKenzie, British Guiana, to Port Alfred on the Saguenay river; thus the production of aluminium at Arvida is an all-empire enterprise, from mines to finished product. The one plant of the Company located at Arvida was active throughout the year, while aluminium ingot was manufactured at both the Shawinigan Falls and Arvida reduction plants.

During 1936 the Noranda Mines Limited smelter treated 1,120,455 tons of ore, concentrate and refinery slag, and produced 65,376,337 pounds of anodes; after deducting the amount of copper, gold and silver in the refinery slag that was smelted, the estimated production of new copper, gold and silver was 62,750,342 pounds of fine copper, 342,495 ounces of gold and 543,250 ounces of silver. The concentrator milled 1,070,597 tons of ore from the Horne mine, the average analysis of which was 1.86 per cent copper, 0.137 oz. gold per ton and 0.34 oz. silver per ton from which 179,027 tons of concentrate were produced; the cyanide mill treated 149,700 tons of pyrite from the flotation plant tailing, from which 10,016 ounces of gold were recovered. The tonnage of direct smelting ore delivered to the smelter was 483,895 containing 2.82 per cent copper, 0.370 ounces of gold per ton and 0.46 ounces of silver per ton.

Silicious fluxing ore delivered to the smelter totalled 455,438 tons containing 0.46 per cent copper, 0.128 ounces of gold per ton and 0.17 ounces of silver per ton.

Steady operations were maintained throughout 1936 by Canadian Copper Refiners Limited at its electrolytic copper refinery located in Montreal East; production at this plant included electrolytic copper, gold, silver, selenium and tellurium.

ONTARIO - The International Nickel Company of Canada, Ltd. milled and concentrated 3,317,988 tons of ore in 1936 and the concentrator capacity was enlarged to treat 11,000 tons of ore per day. The Copper Cliff smelter produced 149,000 tons of bessemer matte and 139,796 tons of blister copper. This plant was extended during the year and two reverberatory furnaces and seven converters installed, thus bringing the total smelter equipment to seven reverberatory furnaces and nineteen converters. These additional facilities increase productive capacity by one-third. At the Coniston smelter the four blast furnaces and five converters were operated throughout the year. Ore to the amount of 834,314 tons were processed and 56,827 tons of bessemer matte produced. The nickel refinery of the company, located at Port Colborne, Ontario, operated at capacity throughout the year and produced 103,860,757 pounds of nickel; an addition to this plant, which increased capacity by 50 per cent, was completed during 1936; a small plant was also built for the fabrication of "monel" hot water tanks and range boilers.

The reduction plant of Falconbridge Nickel Mines Ltd. was in operation 332.6 days in 1936; suspension of operations was forced through the failure of power-supply when the Stinson generating station of Hydro was destroyed by fire in September; smelter extensions were completed during the shutdown. During the year 327,783 tons of ore were treated, of which 126,782 tons were milling grade and 201,001 tons for direct smelting. From this were produced 10,244 short tons of matte containing 5,682.5 short tons of nickel and 2,644.4 short tons of copper. Ore treated was reported to contain 1.90 per cent nickel and 0.92 per cent copper.

Adjustments and increases at the smelter embraced the erection of an 18x300 foot reinforced concrete chimney, a new dust chamber and flue system. Sintering capacity was increased, a gas exhausting and dust collecting system installed and a new flue constructed; a new converter was also installed and the blast furnace extended.

Near Goward, in the Temagami Forest Reserve, nickel-copper ores were smelted by Cunipitau Mines Limited and the resultant matte was exported for further treatment in European metallurgical plants.

At Deloro, in Hastings County, the smelter and refinery of the Deloro Smelting and Refining Co. Ltd. was in continuous operation throughout the year. This company treats silver-cobalt ores from Northern Ontario and produces silver bullion, white arsenic, cobalt metal, cobalt salts and oxides, nickel oxide, and a silver-lead-bismuth bullion.

During 1936 the Port Hope radium refinery of Eldorado Gold Mines Ltd. constantly increased its production and the company reports that definite evidence is in hand that the processes now in effect are satisfactory, economical and profitable. With the considerable and rather accelerated increase in production which has been required to meet the demands for radium (present production - March, 1937 - being at the approximate rate of 2.5 grams per month) the facilities at the refinery were soon strained and it has been decided to treble the capacity of the present refinery. November, 1936, witnessed the completion in production of the first ounce of radium. Uranium is also produced from pitchblende at the Port Hope refinery and the company reports that there is a widespread demand for this product in the ceramic industry in which it is utilized in the colouring of glass, pottery and enamelware and for obtaining a satisfactory glaze. In addition to radium and uranium products the company also recovers important quantities of silver.

Blister copper treated in the electrolytic refinery of the Ontario Refining Co. Ltd. at Copper Cliff, Ontario, averaged slightly over 12,000 tons per month and operations were above the rated capacity for the first time. There were several new developments during the year, the most important being the installation of a 30 ton arc type electric melting furnace, and a scheme for transporting molten copper from the Copper Cliff smelter to the refinery, a distance of about one mile. Gold, silver, tellurium, selenium, nickel salts and nickel residues are also produced in this refinery.

MANITOBA AND SASKATCHEWAN - The copper smelter of the Hudson Bay Mining and Smelting Co. Ltd. is located on or adjacent to the inter-provincial boundary between Manitoba and Saskatchewan. It was operated continuously throughout 1936, treating nearly the same tonnage of pay charge as in the preceding year. All but 135 tons of pay charge was from materials produced by the company. Due to the fact that a considerable tonnage of custom copper concentrates is expected to be received during the latter part of 1937, several alterations were made to increase the capacity of the reverberatory furnace, also a fourth copper roaster installation was completed during the fore part of the year. There was smelted in the reverberatory furnace during 1936 a total of 296,877 tons of Flin Flon ore and concentrates averaging 0.393 oz. gold per ton, 5.10 ounces silver per ton and 8.23 per cent copper. There were produced and shipped 22,658 tons of blister copper, with an average assay of gold, 5.004 ounces per ton; silver, 63.48 ounces per ton and copper 98.67 per cent. The average tonnage of new pay material treated per day by the smelter was 812 tons.

There were treated in the cyanide plant a total of 1,073,778 tons of sulphide ore tailings which had an average assay value of gold, 0.0350 ounces per ton and silver, 0.506 ounces per ton; from the treatment of these tailings there were recovered 12,782 ounces gold, 133,105 ounces silver and 53,387 pounds of copper; this material was sent to the copper converters and is included in the blister copper production under the copper smelter.

The electrolytic zinc plant operated continuously throughout the year producing the largest amount of slab zinc to date; the grade of the electrolytic zinc produced was 99.9901 per cent zinc. The production of die casting zinc, which amounted to 2,098 tons, was almost double that of the preceding year. There was treated during the year in the zinc plant a total of 87,137 tons of zinc concentrates averaging 0.059 ounces of gold per ton; 1.77 ounces of silver per ton, 0.77 per cent copper and 45.5 per cent zinc from which was produced for sale a total of 64,437,820 pounds of slab zinc. There was also produced the usual zinc plant residue which was sent to stockpiles.

The complete cadmium plant was finished and a total of 5,413 dry tons of precipitates drawn from stocks and current production were treated during the year. From this source and the stocks of cathode cadmium on hand there was produced a total of 259,883 pounds of metallic cadmium, which assayed 99.9925 per cent cadmium.

BRITISH COLUMBIA - Consolidated Mining and Smelting Company of Canada Limited reported that the cost of mining and milling a ton of ore was exactly the same as in 1935; the direct cost per pound of recoverable metal was slightly less due to the grade of the ore extracted, being about three-quarters of one per cent of metal content above 1935. Production in the lead smelting plant was an all-time high record and costs were an all-time low record; lead recoveries were slightly lower than in 1935. Lead production in the refinery increased steadily throughout the year, the tonnage for 1936 being 182,541 tons against 164,329 in 1935, the previous record year. Production in the zinc plant was 118,971 tons against 119,572 tons in 1935. While the cost of zinc in 1936 was .17 cents higher than in 1935, it was more than accounted for in lower silver credit. Zinc concentrates sold increased the zinc production to 125,694 tons; a purer grade of zinc was made and a product carrying 99.995 per cent zinc can be supplied regularly. Cadmium, a by-product metal from zinc reduction, and bismuth, a by-product metal from lead operation, added about \$400,000 to the receipts from the metal sales.

The fertilizer plant has been undergoing several changes to combine the operations of the direct production units with the new sulphur dioxide absorption and recovery plants. Up to 165 tons per day of excellent grade ammonium sulphate have been recovered at a cost slightly above the cost of that made directly from ammonia and sulphuric acid. A remarkably pure elemental sulphur is also obtained from these plants. All the gases from the zinc plant will now be treated, the sulphur from the fumes being recovered as ammonium sulphate, sulphuric acid and elemental sulphur—the last two being interchangeable. When the absorption plant proved successful, an appropriation was made to build further absorption plants to treat the tail gas from the sulphuric acid plant and to start recovery of the low-grade roaster gas from the lead plant. Two additional units have been added to the hydrogen plant (the limiting plant in the ammonia group), making a 37 ton increase in the ammonia production.

Table 1 - PRINCIPAL STATISTICS OF THE NON-FERROUS METALLURGICAL INDUSTRY IN CANADA,
1935 and 1936.

	1935	1936
Number of companies	12	11
Number of plants	14	14
Capital employed\$	145,686,299	143,858,717
Number of salaried employees	935	863
Salaries\$	2,055,694	2,176,110
Number of wage-earners	8,009	9,152
Wages\$	10,631,662	12,169,940
Value of plant products (gross) /\$	186,245,658	229,737,420
Estimated cost of ores, concentrates, etc., treated (a)\$	108,081,395	137,857,432
Cost of fuel and purchased electricity (b) \$	11,242,698	12,613,763
Process supplies other than items (a) and (b)\$	7,479,978	7,989,580
Value added by smelting (net)\$	59,441,587	71,276,645

/ The gross value of production should not be interpreted as the ultimate sale value of finished metal only as it represents the combined values of all industry (smelting, refining, etc.) end products (blister copper-matte, etc.) and in this sense is a duplication of values.

Table 2 - NUMBER OF WAGE-EARNERS, BY MONTHS, 1932, 1933, 1934, 1935 and 1936.

Month	1932	1933	1934	1935	1936
January	5,496	5,003	6,870	7,280	8,660
February	5,400	4,831	6,832	7,407	8,544
March	5,355	4,926	7,034	7,452	8,665
April	4,750	4,890	7,264	7,636	8,694
May	4,297	4,910	7,530	7,945	8,858
June	4,475	5,534	7,717	7,982	8,912
July	4,205	6,080	7,734	8,201	9,406
August	4,160	6,322	7,767	8,495	9,606
September	4,198	6,368	7,595	8,231	9,626
October	4,326	6,478	7,816	8,365	9,623
November	4,316	6,396	7,620	8,587	9,542
December	4,274	6,410	7,606	8,529	9,669
AVERAGE	4,604	5,681	7,449	8,009	9,152

Table 3 - FUEL AND ELECTRICITY USED IN THE NON-FERROUS SMELTING AND REFINING INDUSTRY, 1935 and 1936.

1935 and 1936					
Kind	Unit of measure	For light and power		For metallurgical purposes	
		Quantity	Cost \$	Quantity	Cost \$
<u>1 9 3 5</u>					
Bituminous coal - Canadian	ton	8,226	40,146	389,978	2,455,340
Imported	ton	23,165	143,050	99,086	553,355
Anthracite	ton	70	1,148	46	334
Coke	ton	2,167	22,782	255,916	2,464,933
Gasoline (exclusive of that used in motor cars)	Imp.gal.	61,556	11,501	609	181
Fuel oil and diesel oil	Imp.gal.	3,241,265	130,583	11,518,943	610,359
Kerosene or coal oil	Imp.gal.	5,728	1,247	...	...
Wood (cords of 128 cu. ft.)	cord	204	1,482	8,800	61,347
Gas - Manufactured	M cu.ft.	61,674	8,186	44,386	5,000
Natural	M cu.ft.	131	107	...	...
Other fuel	xxx	...	7,694	...	3,287
Electricity purchased	K.W.H.	1,054,483,030	3,408,455	577,944,639	1,312,181
TOTAL	xxx	...	3,776,381	...	7,466,317
Electricity generated for own use	K.W.H.	18,600,918	...	4,282,499	...
Process supplies used, chemicals, etc.	\$		7,479,978		
<u>1 9 3 6</u>					
Bituminous coal - Canadian	ton	12,256	61,194	459,313	2,843,370
Imported	ton	27,320	161,631	78,589	452,750
Anthracite	ton	52	717	...	...
Coke	ton	1,142	12,616	279,452	2,727,536
Gasoline (exclusive of that used in motor cars)	Imp.gal.	82,557	16,274	2,358	680
Fuel oil and diesel oil	Imp.gal.	76,060	5,334	14,597,844	766,703
Kerosene or coal oil	Imp.gal.	2,871	645	4,371	370
Wood (cords of 128 cu.ft.)	cord	9	28	8,764	67,105
Gas - Manufactured	M cu.ft.	653	1,325	28,463	2,909
Natural	M cu.ft.	370	260	...	...
Other fuel	xxx	...	882	...	7,882
Electricity purchased	K.W.H.	1,240,494,288	3,595,564	942,223,934	1,887,513
TOTAL	xxx	...	3,856,490	...	8,757,273
Electricity generated for own use	K.W.H.	29,851,136	...	55,123,271	...
Process supplies used, chemicals, etc.	\$		9,582,122		

Table 4 - POWER(x) EMPLOYED IN THE NON-FERROUS SMELTING AND REFINING INDUSTRY, 1935 and 1936.

Kind	1 9 3 5		1 9 3 6	
	Number of units	Total horse power	Number of units	Total horse power
Steam engines and steam turbines	39	19,831	36	14,610
Gasoline, gas and oil engines(a)	39	2,283	36	2,353
Hydraulic turbines or water wheels ..	10	14,035	11	51,125
Electric motors operated by purchased power	4,985	246,698	5,685	280,950
Electric motors operated by company's power	879	17,149	617	8,456
Boilers	60	27,826	62	28,391

(x) Includes emergency or reserve equipment. (a) In 1936 includes one diesel engine rated at 156 H. P.

Table 5 - METAL PRICES, 1932 - 1936.

Metal	Market	Unit of measure	1932	1933	1934	1935	1936
			\$	\$	\$	\$	\$
Arsenic (As ₂ O ₃)	New York	Pound	0.04	0.04	0.04	0.035	0.035
Cobalt (nominal)	New York	Pound	2.50	2.50	2.50	2.50	2.50
Cobalt oxide ..	New York	Pound	1.35	1.35	1.35	1.37	1.38
Copper	New York	Pound	0.05555	0.07025	0.08428	0.08649	0.09474
Copper	London	Pound	0.06380(x)	0.074548(x)	0.074193(x)	0.07795(x)	0.09477(x)
Lead	London	Pound	0.0211(x)	0.023916(x)	0.024364(x)	0.03133(x)	0.03913(x)
Silver	New York	Ounce	0.3167(x)	0.378328(x)	0.474609(x)	0.64790(x)	0.45126(x)
Zinc	London	Pound	0.0240(x)	0.032105(x)	0.030436(x)	0.03099(x)	0.03315(x)
Gold	World	Fine Ounce	23.47(x)	28.60(x)	34.50(x)	35.19(x)	35.03(x)

(x) Canadian funds.

Table 6 - CAPACITIES OF CANADIAN COPPER SMELTING AND REFINING WORKS, 1936(x)

Company	Number	BLAST FURNACES	Number	REVERBERATORIES	Number	CONVERTERS
		Annual capacity- tons of ore and concen- trates		Annual Capacity- tons of ore and concen- trates		Annual Capacity - tons of ore and concen- trates
Consolidated Mining & Smelting Co. (b) ....	...	...	1	48,000	2	16,000
Falconbridge Nickel Mines	1	275,000	...	...	3	25,000
Hudson Bay Mining & Smelting Co. ....	...	...	1	325,000	2	...
Noranda Mines .....	...	...	2	950,000	4	175,000
International Nickel Company	4	800,000	7	2,800,000	24	...

(x) American Bureau of Metal Statistics.

(b) Idle.

ELECTROLYTIC COPPER REFINERIES

Annual Capacity - short tons

Canadian Copper Refiners Ltd.	75,000
Ontario Refining Co. Ltd.	120,000

Table 7 - PRODUCTION / of NEW COPPER in CANADA, from all sources, 1932 - 1936.

	Pound	\$
1932	247,679,070	15,294,058
1933	299,982,448	21,634,853
1934	364,761,062	26,671,438
1935	418,997,700	32,311,960
1936	421,027,732	39,514,101

/ Including copper in ores and matte exported and in blister and anode copper made in Canada.

Table 8 - COPPER PRODUCTION IN CANADA, BY PROVINCES AND SOURCES, ALSO IMPORTS AND EXPORTS OF COPPER, 1935 and 1936.

	1	9	3	5	1	9	3	6
	Pounds			Value	Pounds			Value
				\$				\$
PRODUCTION --								
By Provinces --								
Nova Scotia					779,307			73,855
Quebec	79,050,906			6,162,350	66,340,175			6,287,058
Ontario	252,027,928			19,295,965	287,914,078			26,898,920
Manitoba	38,011,371			2,963,146	29,853,220			2,829,190
Saskatchewan	11,429,452			890,974	14,971,609			1,418,859
British Columbia	38,478,043			2,999,525	21,169,343			2,006,219
TOTAL	418,997,700			32,311,960	421,027,732			39,514,101
By Sources --								
In blister and anode copper produced	386,840,587			30,155,849	382,310,369			36,231,553
In ore, concentrates and copper matte exported	19,612,674			1,528,889	13,894,160			930,053
In nickel-copper matte exported ...	12,544,439			627,222	24,823,203			2,352,495
TOTAL	418,997,700			32,311,960	421,027,732			39,514,101
IMPORTS --								
Copper in bars or rods, when imported by manufacturers of trolley, telegraph and telephone wires and electric cables for use only in the manufacture of such articles in their own factories	611,500			72,117	742,400			93,489
Copper bars for use only in the manufacture of rods to be used exclusively in the manufacture of electrical conductors, and copper rods for such manufacture, individual units of conductors not to exceed area of No. 7-0 gauge conductor.....	6,600			700	18,700			1,858
Copper in bars or rods, in lengths of not less than 6 feet, unmanufactured	120,800			20,435	165,500			30,723
Copper in blocks, pigs or ingots ..	37,200			3,719	189,300			19,858
Copper, scrap, cathode plates, etc.	16,300			1,416	7,000			316
Copper in strips, sheets or plates not polished or coated	324,300			60,044	378,700			71,262
Copper tubing in lengths of not less than 6 feet, and not polished, bent or otherwise manufactured	362,778			81,193	431,244			106,253
Copper wire	16,271			3,566	21,055			5,017
Copper wire cloth, or woven wire of copper .....	...			3,242	...			6,263
Copper, manufactures of, n.o.p. ...	...			352,961	...			388,399
Copper, precipitate of, crude	4,420			486	...			...
Anodes of nickel, zinc, copper, silver or gold .....	...			...	...			6,384
Copper, sub-acetate of, or verdigris, dry	6,613			1,062	7,015			1,212
Copper, sulphate of (blue vitriol).	5,518,899			161,092	4,542,122			149,889
Copper rollers adapted for use in calico printing .....	...			71,836	...			78,621
Copper, sulphate of, dehydrated, for agricultural or spraying purposes	32,100			2,747	7,000			583
TOTAL .....	...			836,616	...			960,127

Table 8 - COPPER PRODUCTION IN CANADA, BY PROVINCES AND SOURCES, ALSO IMPORTS AND EXPORTS OF COPPER, 1935 and 1936 (concluded).

EXPORTS OF COPPER, 1923 and 1936 (Concluded).								
	1	9	3	5	1	9	3	6
	Pounds		Value		Pounds		Value	
			\$				\$	
EXPORTS —								
Copper, fine, contained in ore, matte, regulus, etc.	38,702,700		1,870,542		45,519,600		2,971,042	
Copper, blister	73,356,200		5,589,624		...		...
Copper, old and scrap	6,327,400		360,000		8,108,700		535,753	
Copper in ingots, bars, cakes, slabs and billets	243,535,200		18,061,278		310,860,400		27,460,714	
Copper in rods, strips, sheets, plates, and tubing	36,516,100		3,065,480		48,152,900		4,769,923	
Copper wire and cable .....	...		469,552		...		469,789	
Copper manufactures, n. o. p. ..	...		245,221		...		294,433	
TOTAL .....	...		29,661,697		...		36,501,654	
Copper coin, foreign .....	...		1,596		...		3,048	
Copper coin, Canadian .....	...		93		...		570	

(x) Includes a small production from the N. W. T.

Table 9 - PRODUCTION OF REFINED COPPER IN CANADA, 1931 - 1936.

	Short tons
1931	92,183
1932	90,077
1933	112,245
1934	149,261
1935	173,290
1936	191,818

Table 10 - COPPER PRODUCTION OF THE WORLD ON SMELTERY BASIS (In tons of 2,000 lb.)

	1928	1931	1935	1936
United States	1,060,568	612,732	493,552	724,296
Whereof from scrap	32,666	12,893	74,725	65,262
Whereof from foreign ore ..	92,703	75,208	38,727	44,063
Mexico	50,577	47,427	45,387	35,395
Canada	62,046	119,925	193,553	189,241
Chile	305,855	237,711	285,743	269,652
Peru	57,641	48,655	31,800	35,741
Austria	3,773	3,566	1,474	(x) 1,543
Finland .....	...	...	...	7,205
Germany	53,462	61,178	61,729	65,366
Great Britain	15,432	10,472	11,023	6,720
Yugoslavia	16,629	26,842	42,689	43,126
Norway	868	4,301	9,308	9,173
Russia	22,046	34,278	69,717	91,491
Spain	23,381	19,377	11,500	9,500
Sweden	3,743	4,852	9,656	10,991
Other Europe	11,410	8,178	3,700	3,600

Table 10 - COPPER PRODUCTION OF THE WORLD ON SMELTERY BASIS (concluded)

	1928	1931	1935	1936
Japan	75,213	83,607	76,507	86,672
India .....	...	4,557	7,728	8,062
Other Asia	1,000	1,000	1,000	1,000
Australasia	10,917	14,796	17,793	17,832
Africa	129,538	151,174	293,576	269,578
Whereof, Belgian Congo ..	...	132,300	118,699	105,500
Whereof, Rhodesia .....	...	8,393	163,319	154,337
TOTALS	1,904,099	1,494,628	1,667,435	1,886,184
Deduct, U. S. Scrap	32,666	12,893	74,725	65,262
TOTAL NEW COPPER ..	1,871,433	1,481,735	1,592,710	1,820,922

Table 11 - 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

According to the American Bureau of Metal Statistics, the lead refining capacity of the world in 1936 aggregated about 1,030,000 short tons in the United States and about 2,073,000 elsewhere; there was an increase of about 80,000 tons in capacity during 1936, occurring entirely outside of the United States; probably not more than 900,000 tons of the listed capacity in the United States and 1,500,000 tons elsewhere, a total of 2,400,000 tons, is to be rated as useful and effective, the remainder being obsolete, incapable of economical ore supply, or otherwise useless. Lead refining capacity of some of the more important lead producing countries, other than the United States, expressed in metric tons, are: Canada, 163,300; Mexico, 293,900; Belgium, 137,000; France, 119,700; Germany, 207,000; Great Britain, 165,800; Spain, 263,300 and Australia, 203,000.

Table 12 - LEAD PRODUCTION(✓) in CANADA, ALSO IMPORTS AND EXPORTS OF LEAD, 1935 and 1936.

	1	9	3	5	1	9	3	6
	Pounds			Value	Pounds			Value
				\$				\$
<u>PRODUCTION -</u>								
Nova Scotia .....	...			...	1,901,712			74,414
Quebec	2,047,624			64,156	2,047,689			80,126
Ontario	22,532			706	17,442			683
Manitoba	19,179			601				
British Columbia	336,784,326			10,552,059	376,645,367			14,738,133
Yukon (a)	231,418			7,250	2,568,699			100,513
TOTAL	339,205,079			10,624,772	383,180,902			14,933,869

Table 12 - LEAD PRODUCTION (A) in CANADA, ALSO IMPORTS AND EXPORTS OF LEAD, 1935 and 1936, (concluded)

	and 1938. (continued)								
	1	9	3	5		1	9	3	6
	Pounds		Value			Pounds		Value	
			\$					\$	
<u>IMPORTS -</u>									
Old and scrap, pig and block ...	108,863			5,472		63,879			4,234
Bars and sheets	69,794			2,959		36,192			2,117
Litharge	1,750,400			100,689		1,968,600			124,001
Acetate of lead	216,600			16,504		128,569			8,637
Nitrate of lead	201,160			11,447		163,283			9,292
Other manufactures .....	...			70,988		...			79,823
Pipe lead	4,022			301		24,084			1,818
Shots and bullets	9,824			696		8,066			828
Tea lead	3,410			252		...			...
Lead arsenate	324,328			26,388		223,300			20,096
Lead tetraethyl, compounds of ..	2,381,734			1,249,477		3,019,356			1,414,720
Lead capsules for bottles .....	...			44,965		...			63,964
Lead pigments —									
Dry white lead	16,196			1,089		21,302			1,458
White lead, ground in oil	16,788			1,424		15,137			1,348
Dry red lead and orange mineral	595,584			35,392		847,859			55,353
TOTAL .....	...			1,568,043		...			1,787,689
<u>EXPORTS -</u>									
Lead, contained in ore	11,305,100			289,955		9,395,500			287,569
Pig lead	282,913,500			6,871,469		321,350,900			10,113,282
White lead	217,100			14,068		634,200			43,555
TOTAL .....	...			7,175,492		...			10,444,406

(A) Including lead in ores exported.

(a) Includes a small quantity of lead produced in N. W. T. in 1935.

Table 13 - PRODUCTION OF REFINED LEAD IN CANADA, 1931 - 1936.

	Pounds
1931	278,448,457
1932	253,136,522
1933	254,565,861
1934	314,457,735(A)
1935	327,515,277(A)
1936	363,449,490(A)

(A) Primary lead only.

Table 14 - WORLD PRODUCTION OF LEAD(a) (short tons)

Origin	1922	1929	1933	1934	1935	1936
North America ..	649,022	1,121,394	562,213	687,515	744,843	828,551
South America ..	6,547	34,038	12,617	10,892	9,658	24,300
Total Europe ...	314,647	458,279	404,199	446,521	449,503	454,921
Total Asia	53,441	100,743	92,453	90,776	89,574	94,061
Australia	118,064	195,403	233,532	226,336	243,046	221,121
Africa	37,419	22,663	16,395	30,105	27,236	23,200
GRAND TOTAL ...	1,179,140	1,932,520	1,321,409	1,492,145	1,563,860	1,646,154

(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 1936, Canada contributed 184,659 short tons, excluding lead exported to European countries. As a world producer of lead Canada ranked fourth in 1936.

Table 15 - CAPACITY AND PRODUCTION OF ELECTROLYTIC ZINC PLANTS IN CANADA, 1934 - 1936.

	Maximum H. P. used (a)	Estimated annual ca- pacity for cathode zinc (short tons) (b)	Actual production as ingot zinc (short tons)		
			1934	1935	1936
Consolidated Mining & Smelting Co. of Canada Ltd.	67,000	143,000	110,217	119,051	119,478
Hudson Bay Mining & Smelting Co. Ltd.	19,600	35,000	24,714	30,052	32,219

Supplied by the American Bureau of Metal Statistics.

(a) Expressed as power in terms of direct current after transforming the alternating current in sub-stations at the works.

(b) Capacity for ingot zinc may be reckoned at 95% of capacity for cathode deposition.

The American Bureau of Metal Statistics estimates the capacity of American zinc metallurgical works at the end of 1936 as being nominally for the production of 700,000 short tons of spelter per annum by distilling and 204,000 tons by electrolysis, a total of 904,000 tons, but the first-class effective capacity is something less, probably not more than for 850,000 tons, and perhaps materially less than that. The effective capacity outside the United States (exclusive of Russia) at the end of 1936 is estimated at 1,150,000 metric tons whereof about 250,000 tons were in Australia, Canada and Mexico, and about 900,000 tons elsewhere.

Table 16 - PRODUCTION OF NEW ZINC IN CANADA, ALSO IMPORTS AND EXPORTS OF ZINC, 1935 and 1936.

	1	9	3	5	1	9	3	6
	Pounds			Value	Pounds			Value
				\$				\$
PRODUCTION (A) -								
Nova Scotia .....	...			...	6,180,219			204,874
Quebec	5,322,844		164,955		6,896,123			228,606
Manitoba	51,129,980	1,584,513			36,744,951		1,218,095	
Saskatchewan	8,974,720	278,126			27,692,869		918,019	
British Columbia	255,222,315	7,909,314			255,668,574		8,475,413	
TOTAL	320,649,859	9,936,908			333,182,736		11,045,007	

Table 16 - PRODUCTION OF NEW ZINC, ALSO IMPORTS AND EXPORTS OF ZINC, 1935 and 1936.

	1 Pounds	9 Value \$	3 Pounds	5 Value \$
IMPORTS -				
Zinc dust	1,648,100	80,837	1,619,800	68,914
Zinc in blocks, pigs, bars and rods, and zinc plates, n. o. p.	18,100	2,111	11,400	1,238
Zinc in sheets and strips, and zinc plates for marine boilers	5,579,000	349,013	5,739,200	394,327
Zinc spelter	115,300	4,254	...	...
Zinc white (zinc oxide)	11,768,314	460,122	13,240,889	519,425
Zinc sulphate	2,042,284	29,459	832,886	12,830
Zinc, chloride of	1,869,056	55,942	1,933,034	60,724
Zinc, manufactures of n. o. p. ....	...	128,536	...	121,863
Lithopone	17,383,273	620,615	18,859,517	666,667
TOTAL .....	...	1,730,889	...	1,845,988
EXPORTS -				
Zinc, contained in ore	19,600,200	337,732	39,132,000	727,253
Zinc, scrap, dross and ashes	6,267,500	63,719	5,007,100	63,875
Zinc, spelter	270,918,800	7,809,691	280,422,900	8,523,906
TOTAL - EXPORTS	296,786,500	8,211,142	324,562,000	9,315,034

(A) From all sources, including metal in ores exported.

Table 17 - REFINED NEW ZINC PRODUCED IN CANADA, 1931 - 1936.

	Short tons
1931	118,622
1932	86,141
1933	91,946
1934	134,917
1935	149,523
1936	151,103

Table 18 - WORLD'S PRODUCTION OF ZINC (a) (In short tons - 2,000 lb.)

Country	1929	1935	1936
United States	631,601	431,499	523,166
Mexico	29,954	44,084	35,506
Canada	86,049	149,103	151,697
Belgium	218,145	200,332	217,908
Czechoslovakia	12,604	10,283	8,667
France	100,984	56,729	59,084
Germany	112,435	136,906	150,354
Great Britain	65,294	67,717	68,086
Italy	17,421	28,950	29,762
Yugoslavia	8,061	3,752	3,967
Netherlands	28,342	15,153	17,006
Norway	6,080	49,624	49,604
Poland	186,324	93,688	105,197
Russia	3,789	50,922	72,752
Spain	13,035	8,429	8,601

Table 18 - WORLD'S PRODUCTION OF ZINC (a)(concluded)(In short tons - 2,000 lb.)

Country	1929	1935	1936
Sweden	5,201	...	...
Australia	56,001	74,856	77,778
Japan	24,360	37,206	43,342
French Indo-China	4,196	4,250	4,528
Rhodesia	13,575	23,122	23,217
TOTALS, ex U. S. A.	991,850	1,055,106	1,127,056
Grand Totals	1,623,451	1,486,605	1,650,222

(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.

(Supplied by American Bureau of Metal Statistics)

Table 19 - WORLD PRODUCTION OF NICKEL ORE, 1932 - 1936(a). (in terms of metal)

Country	1932	1933	1934	1935	1936
(short tons)					
Canada (b)	15,164	41,632	64,344	69,258	84,869
New Caledonia (c)	3,200	4,900	5,500	6,200	5,000
Greece (e)	1,053	1,344	1,200	1,200	1,300(x)
India (d)	1,042	1,090	1,354	1,640	1,500
Norway	1,042	1,096	1,532	1,677	1,700(x)
Russia .....	...	...	951	1,500(x)	2,000(x)

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

(b) Production in all forms from Canadian ores.

(c) Exports of matte; content, estimated at 75%. Estimated for 1936.

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

(e) Nickel and cobalt content beginning 1934.

(x) Conjectural.

(Supplied by American Bureau of Metal Statistics)

Table 20 - WORLD PRODUCTION OF ALUMINIUM (supplied by the American Bureau of Metal Statistics) (in metric tons)

Country	1922	1929	1932	1934	1935	1936
United States	33,600	102,100	47,600	33,646	54,113	102,028
Canada	10,000	42,000	18,000	15,500	20,556	26,900
Europe	48,200	137,198	87,769	119,656	179,404	229,500
Japan .....	...	...	...	700	4,000	5,000
TOTAL FOR WORLD ..	91,800	281,298	153,369	169,502	258,073	363,428

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

Canadian gold production in 1936 totalled 3,748,028 fine ounces valued in Canadian currency at \$131,293,421. Canada in 1936, as a gold producing country, was surpassed only by the Union of South Africa and Russia. The origin of Canadian production is shown in the following table.

Table 21 - SOURCE OF CANADIAN FINE GOLD PRODUCTION, BY PERCENTAGES, 1932 - 1936.

	1932	1933	1934	1935	1936
	%	%	%	%	%
In alluvial gold	1.8	2.0	2.0	1.84	2.27
In crude gold bullion(x)	79.3	79.8	78.68	78.83	77.37
In base bullion (from silver-lead ores, etc.)	1.0	0.7	1.09	2.17	1.60
In blister and anode copper .	15.1	14.2	13.41	13.21	13.80
In ores, matte, slags, etc., exported	2.8	3.3	4.82	3.95	4.96
	100.0	100.0	100.0	100.0	100.0

(x) Includes a relatively small quantity of gold contained in inter-provincial shipments of gold ores to smelters.

Canadian silver production in 1936 totalled 18,334,487 fine ounces valued at \$8,273,804. The Dominion in 1936 ranked fourth as a world silver producing country. The origin of Canadian production is shown in the following table.

Table 22 - SOURCE OF CANADIAN SILVER PRODUCTION BY PERCENTAGES, 1932 - 1936.

	1932	1933	1934	1935	1936
In silver-cobalt ores	28.5	20.4	18.7	15.0	12.24
(x) In base bullion	29.2	34.6	45.1	47.9	46.28
In gold ores (bullion and placer) .	2.5	3.0	7.2	7.4	9.67
In blister copper	15.5	19.5	23.4	26.1	23.76
In matte, copper ores and silver-lead ores exported	24.3	22.5	5.6	3.6	8.05
	100.0	100.0	100.0	100.0	100.0

(x) Chiefly from silver-lead ores.

Table 23 - OTHER NON-FERROUS PRODUCTS PRODUCED IN CANADIAN SMELTERS AND REFINERIES, 1935 - 1936.

	Unit	1	9	3	5	1	9	3	6
					\$				\$
Arsenic (As_2O_3)	lb.	2,558,789			75,326	1,365,606			42,491
Bismuth	lb.	13,797			13,245	364,165			360,523
Cadmium	lb.	580,530			441,203	785,916			699,465
Cobalt (a)	lb.	681,419			512,705	887,591			804,676
Palladium, rhodium, iridium, etc.	oz.	84,772			1,962,937	103,671			2,483,075
Platinum (b)	oz.	105,335			3,444,455	131,551			5,319,922
Radium, uranium (b) .....	...				(data not published)				
Selenium	lb.	366,425			703,536	350,857			621,017
Tellurium	lb.	16,425			32,850	35,591			62,997
Sulphur (c)	ton	52,924			529,240	58,964			589,640

(a) Includes metal in ores exported and salts manufactured.

(b) Final refining done at Acton, England.

(c) Sulphur recovered from smelter gases (as elemental sulphur and in sulphuric acid made.)

DIRECTORY

CANADIAN COPPER SMELTING COMPANIES

<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.	14 Finkle St., Woodstock, Ont.	Flin Flon, Man.
(a) Cuniptau Mines Ltd.	38 King St. W., Toronto, Ont.	Goward, Ont.
(a) Smelt nickel-copper ores.		

CANADIAN ELECTROLYTIC COPPER REFINING COMPANIES

Canadian Copper Refiners Ltd.(c)	2 King St. E., Toronto, Ont.	Montreal East, P.Q.
Ontario Refining Co. Ltd. (c)	Copper Cliff, Ont.	Copper Cliff, Ont.
(c) Also produced refined silver, tellurium and selenium.		

CANADIAN LEAD SMELTING AND REFINING COMPANIES

Consolidated Mining and Smelting Co. of Canada, Limited (/)	215 St. James St.W., Montreal, P.Q.	Trail, B.C.
(/) Produce bismuth or bismuth-bearing bullion as by-products.		

CANADIAN ELECTROLYTIC ZINC REFINING COMPANIES(x)

<u>Name</u>	<u>Head Office Address</u>	<u>Plant Location</u>
Consolidated Mining and Smelting Co. of Canada Ltd.	215 St. James St.W., Montreal, P.Q.	Trail, B.C.
Hudson Bay Mining & Smelting Co. Ltd.	Woodstock, Ont.	Flin Flon, Man.
(x) Also produce cadmium.		

CANADIAN SMELTERS AND REFINERS OF COBALT-SILVER-ARSENIC ORES

Deloro Smelting and Refining Company Ltd. (/)	Deloro, Ont.	Deloro, Ont.
(/) Produce silver, cobalt, arsenic and bismuth.		

CANADIAN REFINERS OF URANIUM-RADIUM ORES

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

Aluminium Co. of Canada Ltd.	Canada Life Bldg., Toronto 2, Ont.	Arvida and Shawinigan Falls, P.Q.
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In addition to the companies listed above the Chromium Mining & Smelting Corp. Ltd. treated chromite ores at Sault Ste. Marie, Ontario.

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