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THE NON-FERROUS SMELTING and REFINING INDUSTRY IN CANADA, 1939.

The Non-Ferrous Smelting and Refining Industry, as defined by the Dominion Bureau of Statistics, Ottawa, comprises those firms engaged primarily in the smelting of non-ferrous ores or concentrates and the refining of metals recovered therefrom.

The value added by the industry in the processing of crude or semi-crude material during 1939 totalled \$80,057,833 compared with \$87,091,374 in the preceding year. Refined products included gold, silver, copper, lead, zinc, aluminium, antimony, bismuth, cobalt, cadmium, selenium, tellurium, radium salts, uranium compounds and sulphur; other end products of individual plants or companies were copper-nickel matte, cobalt salts, nickel salts, nickel and cobalt oxides, arsenious oxide, sulphuric acid, platinum metals residues, silver sulphide, zinc dust, zinc oxide, blister and anode copper and copper matte.

The cost of ores, concentrates and other material treated during 1939 was estimated at \$154,879,498 as against a corresponding value of \$173,070,377 in 1938; fuels and purchased electricity consumed totalled \$15,891,301 and the value of chemicals and various other process supplies used amounted to \$11,773,863.

Capital employed by the industry in 1939 was reported at \$192,186,465, which figure includes value of land, plant, materials on hand and in process, finished products and operating funds. Employees totalled 12,449 and salaries and wages paid aggregated \$19,372,119 compared with 12,788 and \$19,549,963, respectively, in 1938.

From January to August 1939, the Dominion Bureau of Statistics' index number of general wholesale prices fluctuated narrowly between 73.7 and 72.4. Then from the latter level in August it jumped to 78.2 in September and thereafter mounted more gradually to 82.2 in the final week of December. The net advance of 11.5 per cent during 1939 in the general index compared with the following percentage increases in component groups: vegetable products 19.2, animal products 11.5, textiles 23.3, wood products 11.7, iron and its products 4.0, non-ferrous metals 5.3, non-metallic minerals 0.2 and chemicals 9.5.

Transposed into Canadian Funds the average price of copper, based on the London market was 10.092 cents per pound in 1939, compared with 9.972 cents per pound in 1938; the average price of lead, based on the same market, was 3.169 cents per pound in 1939 as against 3.344 cents in the preceding year, while a corresponding price per pound for zinc in 1939 was 3.069 as against 3.073 cents in 1938. The average price of silver in Canadian Funds, based on the New-York Market was 40.488 cents per fine ounce compared with 43.477 cents in 1938.

Among the outstanding features in Canada's Mining Industry was an agreement made in 1939 by the large base metal producers and the Imperial Government by which the producers were to supply the Imperial Government with copper, lead and zinc at prices which prevailed shortly before the outbreak of the war. Canada can now furnish large quantities of these metals in the refined form, whereas in 1914 no refined copper, nickel or zinc and only a comparatively small amount of refined lead were produced in this country.

Table 1 - PRINCIPAL STATISTICS OF THE NON-FERROUS METALLURGICAL INDUSTRY IN CANADA, 1937, 1938 and 1939.

	1937	1938	1939
Number of companies	10	10	9
Number of plants	13	13	13
Capital employed	\$ 162,696,595	184,337,126	192,186,465
Number of salaried employees	1,003	1,063	1,089
Salaries	\$ 2,575,849	2,612,284	2,670,414
Number of wage-earners	10,567	11,725	11,360
Wages	\$ 15,415,098	16,937,679	16,701,705
Value of plant products (gross) (A)	\$ 318,278,251	287,295,733	262,602,495
Estimated cost of ores, concentrates, etc., treated (a)	\$ 191,303,251	173,070,377	154,879,498
Cost of fuel and purchased electricity (b)	\$ 14,607,421	15,233,547	15,891,301
Process supplies other than items (a) and (b)	\$ 10,559,714	11,900,435	11,773,863
Value added by smelting (net)	\$ 101,807,865	87,091,374	80,057,833

(A) 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 and 1937-1939.

MONTH	1932	1937	1938	1939
January	5,496	9,814	11,677	11,138
February	5,400	9,842	11,707	11,123
March	5,355	9,966	11,830	11,334
April	4,750	10,153	12,089	11,371
May	4,297	10,458	12,052	11,380
June	4,475	10,814	11,934	11,390
July	4,205	11,047	11,814	11,486
August	4,160	11,172	11,744	11,476
September	4,198	11,031	11,594	11,454
October	4,326	10,895	11,625	11,327
November	4,316	10,868	11,377	11,401
December	4,274	10,749	11,250	11,424
AVERAGE	4,604	10,567	11,725	11,360

Table 3. - FUEL AND ELECTRICITY USED IN THE NON-FERROUS SMELTING AND REFINING INDUSTRY, 1938 and 1939

Kind	Unit of Measure	For light and power		For metallurgical purposes	
		Quantity	Cost	Quantity	Cost
			\$		\$
<u>1938</u>					
Bituminous coal -					
Canadian	short ton	12,381	57,618	492,575	3,070,329
Imported	short ton	30,005	187,559	154,579	901,511
Anthracite coal -					
United States ...	short ton	...	...	...	...
Other	short ton	51	821	...	...
Coke	short ton	318	3,281	290,999	2,740,630
Gasoline	Imp. gal.	90,721	16,583	13,534	3,301
Fuel oil and diesel oil	Imp. gal.	177,521	17,828	20,399,780	1,066,141
Kerosene or coal oil ..	Imp. gal.	6,018	1,195	1,430	329
Wood (cords of 128 cubic feet)	cord	...	...	13,731	70,143
Gas - Manufactured	M cu. ft.	...	...	3,986	5,085
Natural	M cu. ft.	...	...	300	297
Other fuel .....	\$	...	...	...	2,327
Electricity purchased .	K. W. H.	1,056,888,725	3,686,404	1,827,992,887	3,402,165
TOTAL .....	\$	...	3,971,289	...	11,262,258
Electricity generated for own use	K. W. H.	30,545,374	...	234,906,198	...
Process supplies used, chemicals, etc. ....	\$	...	11,900,435		
<u>1939</u>					
Bituminous coal -					
Canadian	short ton	13,091	60,532	571,332	3,434,110
Imported	short ton	32,171	193,277	120,557	703,100
Anthracite coal -					
United States ...	short ton	4	55	...	...
Other	short ton	59	948	...	...
Coke	short ton	1,247	11,858	286,958	2,688,089
Gasoline	Imp. gal.	85,026	16,577	4,332	904
Fuel oil and diesel oil	Imp. gal.	52,701	2,761	22,695,129	1,059,048
Kerosene or coal oil ..	Imp. gal.	5,973	1,143	3,387	708
Wood (cords of 128 cubic feet)	cord	...	...	8,396	41,364
Gas - Manufactured	M cu. ft.	...	...	3,770	4,840
Natural	M cu. ft.	...	...	308	302
Other fuel .....	\$	...	...	...	2,696
Electricity purchased .	K. W. H.	1,205,819,424	3,823,625	2,032,965,845	3,845,364
TOTAL .....	\$	...	4,110,776	...	11,780,525
Electricity generated for own use	K. W. H.	8,472,956	...	245,564,364	...
Process supplies used, chemicals, etc. ....	\$	...	11,773,863		

Table 4 - POWER EMPLOYED IN THE NON-FERROUS SMELTING AND REFINING INDUSTRY, 1939.

Description	Ordinarily in use		In reserve or idle	
	Number of units	Total horse power	Number of units	Total horse power
1. Steam engines and steam turbines ...	25	9,421	3	1,134
2. Gasoline, gas and oil engines	1	65	...	...
3. Hydraulic turbines or water wheels..	11	51,125	...	...
4. Electric motors - (a) Operated by purchased power	6,827	327,381	778	32,484
Total (1), (2), (3) and (4)	6,864	387,992	781	33,618
(b) Operated by power generated by the establishment	321	4,030	23	326
Stationary boilers	29	17,389	6	2,067

Table 5 - METAL PRICES, 1935 - 1939.

Metal	Market	Unit of Measure	1935	1936	1937	1938	1939
			\$	\$	\$	\$	\$
Antimony	New York	Lb.	0.136	0.122	0.153	0.123	0.123
Arsenic (As ₂ O ₃)..	New York	Lb.	0.035	0.035	0.03	0.03	0.03
Copper ..	New York	Lb.	0.08649	0.09474	0.13167	0.1000	0.1096
Copper ..	London	Lb.	0.07795(a)	0.09477(a)	0.13078(a)	0.09972(a)	0.10092(a)
Lead	London	Lb.	0.03133(a)	0.03913(a)	0.05110(a)	0.03344(a)	0.03169(a)
Silver ..	New York	Oz.	0.64790(a)	0.45126(a)	0.44881(a)	0.43477(a)	0.40488(a)
Zinc	London	Lb.	0.03099(a)	0.03315(a)	0.04902(a)	0.03073(a)	0.03069(a)
Gold	World	Fine oz.	35.19(a)	35.03(a)	34.99(a)	35.175(a)	36.141(a)

(a) Canadian funds.

There are two large aluminium smelters in Canada. One plant is at Shawinigan Falls, Quebec, and the other at Arvida, Quebec, the latter being one of the largest in the world. Both are owned by the Aluminum Company of Canada, Limited. Smelting and fabricating operations are combined in the works at Shawinigan Falls, Quebec. It was here, incidentally that the aluminium industry in Canada had its inception. Although bauxite is the largest single raw material for the production of aluminium, four tons being needed to make one ton of the metal, approximately three tons of other materials are also required. The most important of these are petroleum coke, metallurgical coke, cryolite, fluorspar, soda ash and fuel oil. Pitch, tar and a number of other miscellaneous supplies are also consumed. A large part of the aluminium production consists of aluminium alloys. For this, various alloying materials are required, such as silicon and ferro-silicon, manganese, titanium, zinc, and chromium. All bauxite used in the Canadian plants comes from British Guiana while petroleum coke is imported mainly from Gulf of Mexico and Great Lakes ports. Cryolite is obtained from Greenland. However, synthetic cryolite is being used in greater quantities each year. Fluorspar has been obtained mainly from Southern Europe. Of all electro-metallurgical operations, the production of aluminium consumes the most electricity, and it is because Canada has such resources of low cost hydro-electric power that the aluminium industry has been established here. Both the Arvida and Shawinigan plants were in continuous operation throughout 1939.

During 1939 the Noranda Mines Limited Smelter, at Noranda, Quebec, treated 1,335,298 tons of ore, concentrate and refinery slag and produced 107,358,107 pounds of anodes. After deducting the copper, gold and silver which was recovered from the slag received from Canadian Copper Refiners Limited, the estimated production of new metals was 105,363,477 pounds of fine copper, 318,599 ounces of gold and 967,943 ounces of silver. These figures include the production from 310,874 tons of customs ore and concentrate; the estimated recovery from Horne Mine ore being 83,257,148 pounds of fine copper, 266,532 ounces of gold and 595,102 ounces of silver.

With the completion of the extension of the tank house in December, the electrolytic copper refinery of Canadian Copper Refiners Limited, located at Montreal East, Quebec, was increased to approximately 100,000 tons of copper per annum and since the first of 1940, refinery production has been at the new rated capacity.

The smelter of Falconbridge Nickel Mines Limited, located at Falconbridge, Ontario, in 1939, treated 576,801 tons of ore comprising 332,724 tons of milling ore and 244,077 tons of smelting ore. Matte produced totalled 16,965.3 short tons containing 9,232.5 short tons of nickel and 4,691.9 short tons of copper. The refinery located in Norway operated steadily throughout the year.

International Nickel Company of Canada, Limited, reported that in 1939 ore smelting at the Copper Cliff Smelter was uninterrupted and 185,578 tons of bessemer matte and 165,129 tons of converter copper were produced. The Coniston Smelter ran continuously, processing 852,525 tons of ore and producing 50,587 tons of bessemer matte. At Port Colborne, Ontario, the nickel refinery produced 131,730,117 pounds of refined nickel, compared with 124,233,682 pounds in 1938. The Electrolytic Copper Refinery, at Copper Cliff, Ontario, received 165,129 tons of molten converter copper from the Copper Cliff smelter and produced 150,541 tons of refined copper; a second electric furnace was installed and brought into operation in January 1939.

At Deloro, Ontario, the plants of the Deloro Smelting and Refining Company, Limited, were steadily operated throughout the year. Silver-cobalt ores from Northern Ontario were treated and products included fine silver, arsenic, cobalt, cobalt salts, cobalt oxide and nickel oxide.

Eldorado Gold Mines Limited, operated its refinery at Port Hope, Ontario, for approximately eleven and a half months during 1939. Shipments received at the refinery in 1939 amounted to 522 tons of pitchblende concentrates. In addition to this the refinery re-treated 160 tons of tailings from previous years. During the year a new product polonium was introduced to the market. Its present use is for the production of radioactive electrodes in the spark-plug industry. No material change was made in the process of refining radium and uranium.

At Flin Flon, Manitoba, a record tonnage of pay charge of Hudson Bay materials and custom concentrates were treated at the smelter of the Hudson Bay Mining and Smelting Company. There was smelted during 1939 a total of 341,325 tons of Flin Flon Mine concentrates and ore having the following assay value:- gold 0.362 ounces per ton; silver 5.36 ounces per ton and copper 9 per cent. There were shipped 44,805 tons of blister copper containing 142,656 ounces of gold; 2,141,785 ounces of silver; 88,501,247 pounds of copper and 64,692 pounds of selenium. There was treated in the zinc plant a total of 110,854 tons of zinc concentrates from which was produced for sale a total of 77,580,748 pounds of slab zinc. Metallic cadmium production for the year amounted to 140,438 pounds having an average assay of 99.9882% cadmium. Custom concentrate and ore treated in 1939 totalled 61,890 tons.

In British Columbia the tonnage of lead ores smelted by the Consolidated Mining and Smelting Co. of Canada Ltd. in its plants at Trail, was an all time record in 1939 due to smelting a charge of lower lead content. The lead, silver and gold refineries at Trail operated very successfully during the year; refined lead production was down due to the ten per cent curtailment which ended on the 15th September. Gold receipts at Trail in both bullion and high grade ores were lower. The new electrolytic parting plant in the silver refinery went into operation in December. Operations in the zinc plant were very satisfactory during the year and several new records were made. An antimony reduction plant was built to work up an accumulation of antimony arsenic flue dust; this plant made an excellent product. The percentage of sulphur dioxide removed from flue gases from metallurgical operations and utilized mainly in the production of sulphuric acid, sulphur and fertilizers, increased to 70.3 per cent compared with 53.3 per cent in 1937. The principal research investigations during the year included the use of oxygen in suspension roasting of zinc concentrates. Development of an improved process on a semi-commercial scale for the production of magnesium was successfully concluded. A process for the production of manganese has been practically completed and production of oil from tar sands was intensely studied. Compared with 1938 sales and deliveries of various products showed large increases in both tonnage and dollar value - \$35,000,000 against \$28,000,000.

Table 6 - CAPACITIES OF CANADIAN COPPER SMELTING AND REFINING WORKS, 1939 (a)

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. of Canada Ltd. (b) .....	...	...	1	75,000	2	16,000
Falconbridge Nickel Mines Ltd.	1	400,000	...	...	3	50,000
Hudson Bay Mining & Smelting Co. Ltd. ....	...	...	1	420,000	2	...
Noranda Mines Ltd. ....	...	...	2	1,100,000	4	230,000
International Nickel Co. of Canada, Ltd.	4	800,000	7	2,800,000	24	...

(a) American Bureau of Metal Statistics.

(b) Idle.

ELECTROLYTIC COPPER REFINERIES

ANNUAL CAPACITY - short tons

Canadian Copper Refiners Ltd.	100,000
International Nickel Co. of Canada Ltd.	150,000

Table 7. - WORLD PRODUCTION OF SILVER, COPPER, LEAD AND ZINC 1939.

(From Engineering and Mining Journal, February, 1940)

Countries	Silver	Copper	Lead	Zinc
	(fine oz.)	(short tons)	(short tons)	(short tons)
United States.....	57,500,000	745,000	462,200	538,198
Canada.....	23,500,000	303,000	196,000	178,000
Mexico.....	76,500,000	47,500	230,000	43,000
Peru.....	18,750,000	40,000	-	-
Chile.....	-	350,000	-	-
Other America.....	19,000,000	-	-	-
Europe.....	22,000,000	-	-	-
Germany.....	-	37,000	202,000	225,000
Russia.....	-	110,000	77,000	88,500
Spain and Portugal.....	-	38,500	50,000	-
Belgium.....	-	-	92,000	210,000
Italy.....	-	-	47,000	-
France.....	-	-	-	68,000
Great Britain.....	-	-	-	68,000
Poland.....	-	-	-	100,000
Other Europe.....	-	-	-	-
Japan.....	11,000,000	86,000	-	-
India.....	6,500,000	-	-	-
Burma.....	-	-	87,000	-
Other Asia.....	4,500,000	-	-	-
Australasia.....	15,100,000	-	-	-
Australia.....	-	-	266,000	78,000
Africa.....	5,350,000	375,000	-	-
Elsewhere.....	-	212,000	205,000	226,000
Total.....	259,700,000	2,344,000	1,914,200	1,822,698

Reference Silver: Statistics based on refinery output.

Reference Copper: So far as possible, these statistics are based on blister copper, and referred to countries wherein ore originated.

Reference Lead: Production in terms of bullion allocated according to origin of ore.

Reference Zinc: Production of primary metallurgical works.

+ Subject to revision.

Table 8 - PRODUCTION (A) OF NEW COPPER IN CANADA, FROM ALL SOURCES, 1928 - 1939.

Year	Pounds	\$	Year	Pounds	\$
1928.....	202,696,046	28,598,249	1934.....	364,761,062	26,671,438
1929.....	248,120,760	43,415,251	1935.....	418,997,700	32,311,960
1930.....	303,478,356	37,948,359	1936.....	421,027,732	39,514,101
1931.....	292,304,390	24,114,065	1937.....	530,028,615	68,917,219
1932.....	247,679,070	15,294,058	1938.....	571,249,664	56,554,034
1933.....	299,982,448	21,634,853	1939.....	608,825,570	60,934,859

(A) Including copper in ores and matte exported and in blister and anode copper made in Canada.

Table 3. - PRODUCTION IN CANADA, IMPORTS AND EXPORTS OF COPPER, 1938 and 1939.

	1938		1939	
	Pounds	Value \$	Pounds	Value \$
PRODUCTION				
By Provinces -				
Nova Scotia.....	...	...	1,269,179	128,086
Quebec.....	112,645,797	11,233,039	117,238,897	11,831,749
Ontario.....	309,030,106	30,405,500	328,429,665	32,637,305
Manitoba.....	65,582,772	6,539,914	70,458,890	7,110,711
Saskatchewan.....	18,156,157	1,810,532	18,133,149	1,829,997
British Columbia.....	65,759,265	6,557,514	73,253,408	7,392,734
North West Territories.....	75,567	7,535	42,382	4,277
TOTAL.....	571,249,664	56,554,034	608,825,570	60,934,859
By Sources -				
In blister and anode copper produced.....	475,611,107	47,427,940	505,671,337	51,032,350
In ores, concentrates and copper matte exported (a).....	81,810,070	8,158,100	86,730,679	8,752,860
In nickel copper matte exported.....	13,828,487	967,994	16,423,559	1,149,649
TOTAL.....	571,249,664	56,554,034	608,825,570	60,934,859
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.....	1,111,000	146,771	1,225,400	178,492
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.....	5,500	667	5,200	655
Copper in bars or rods, in lengths of not less than 6 feet, unmanufactured.....	200,600	31,666	223,700	37,165
Copper in blocks, pigs or ingots.....	12,200	1,441	6,000	1,325
Copper, scrap, cathode plates, etc.....	87,800	8,434	35,200	3,807
Copper in strips, sheets or plates not polished or coated... ..	166,200	36,813	226,500	56,531
Copper tubings in lengths of not less than 6 feet, and not polished, bent or otherwise manufactured.....	343,071	93,255	377,514	108,955
Copper wire.....	16,352	3,351	34,305	6,681
Copper wire cloth, or woven wire of copper.....	-	3,284	-	5,076
Copper, manufactures of, n.o.p....	-	402,293	-	448,147
Copper, precipitate of, crude....	2,075	193	91	17
Anodes of nickel, zinc, copper, silver or gold.....	-	8,432	-	6,063
(a) Contains a relatively small quantity of copper contained in gold and silver ores shipped to Canadian smelters.				

Table 9.-PRODUCTION IN CANADA, IMPORTS AND EXPORTS OF COPPER, 1938 and 1939 - Concl'd.

	1938		1939	
	Pounds	Value	Pounds	Value
		\$		\$
<u>IMPORTS - Concl'd.</u>				
Copper, sub-acetate of, or verdigris, dry.....	3,505	771	-	-
Copper, sulphate of (blue vitriol).....	4,454,073	160,032	6,285,766	234,259
Copper rollers adapted for use in calico printing.....	-	65,525	-	84,302
TOTAL.....	-	962,928	-	1,171,475
<u>EXPORTS -</u>				
Copper, fine, contained in ore, matte, regulus, etc.....	109,806,100	7,637,581	121,500,900	8,505,064
Copper blister.....	30,527,300	3,056,241	31,111,800	3,113,742
Copper, old and scrap.....	3,437,400	205,059	6,930,000	544,901
Copper in ingots, bars, cakes, slabs and billets.....	363,528,700	35,858,006	331,637,700	33,730,487
Copper in rods, strips, sheets, plates and tubing.....	53,512,900	5,767,622	58,739,300	6,501,892
Copper wire and cable.....	-	435,784	-	522,255
Copper wire, bare.....	-	-	-	237,861
Copper wire, screen.....	-	-	-	16,772
Copper manufactures, n.o.p.....	-	354,509	-	54,945
TOTAL.....	-	53,314,802	-	53,227,919
Copper coin, foreign.....	-	6,693	-	15,015
Copper coin, Canadian.....	-	347	-	239

Table 10. - PRODUCTION (a) OF REFINED COPPER IN CANADA FOR YEARS SPECIFIED

Year	Tons	Year	Tons
1915 .....	...	1935	173,290
1916/.....	483	1936	191,595
1917	3,901	1937	215,080
1918	3,809	1938	227,240
1919	3,467	1939	231,684

/ First electrolytic copper produced commercially in Canada.

(a) From all sources.

Table 11 - COPPER PRODUCTION OF THE WORLD ON SMELTERY BASIS (a). (In tons of 2,000 lb.)
(This statement taken from the Year Book of the American Bureau of Metal Statistics)

	1931	1938	1939
United States.....	612,732	686,965	881,600
Whereof from scrap.....	12,893	55,620	70,126
Whereof from foreign ore.....	75,208	74,672	76,484
Mexico.....	47,427	40,870	48,844
Canada.....	119,925	238,052	252,557
Chile.....	237,711	372,046	357,797
Peru.....	48,655	39,230	37,439
Austria.....	3,566	(b)	(b)
Finland.....	...	13,034	14,601
Germany.....	61,178	75,838	73,000
Great Britain.....	10,472	4,409	4,500(x)
Norway.....	4,301	11,572	11,591
Russia.....	34,278	108,000(x)	118,000(x)
Spain.....	19,377	10,100	8,000(x)
Sweden.....	4,852	11,759	12,497
Yugoslavia.....	26,842	46,288	45,920
Other Europe.....	8,178	11,000	16,000
Japan.....	83,607	111,332	115,000(x)
India.....	4,557	6,000	7,500
Turkey.....	...	2,543	5,034
Other Asia.....	1,000	4,000(x)	5,000(x)
Australia.....	14,796	19,105	22,288
Africa.....	151,174	385,979	383,454
Whereof, Belgian Congo.....	132,300	136,622	133,929
Whereof, Rhodesia.....	8,393	237,362	238,100
Totals.....	1,494,628	2,198,122	2,420,622
Deduct, U. S. Scrap.....	12,893	55,620	70,126
TOTAL NEW COPPER.....	1,481,735	2,142,502	2,350,496

(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, except as to Katanga, a part of whose production is as matte re-smelted in Belgium, wherefore the entire production of Katanga is credited to Belgian Congo irrespective of where the blister copper is produced. In both tabulations every effort has been made to eliminate secondary copper so far as possible. This elimination has been more perfect in recent years than in earlier years. (b) Included in Germany.

Table 12 - AVAILABLE STATISTICS ON THE CONSUMPTION OF COPPER IN SPECIFIED CANADIAN INDUSTRIES, 1937 and 1938.

Industry	Item (Used)	1937	1938
	(Ingots, wire bars, slabs, etc.....lb.	110,573,509	101,588,470
	(Scrap.....lb.	4,864,385	3,929,241
	(Rods.....lb.	13,004	-
	(Pipe and tubing.....lb.	98,254	87,904
Brass and copper Products (a)	(Plates and sheets.....lb.	889,449	773,770
	(Wire.....lb.	323,266	237,858
	(Castings.....lb.	5,324	34,087
	(Other.....lb.	97,103)	

(a) A relatively large part of the copper included under this industry is rolled into wire rods, which are sold to manufacturers of electrical cable; duplication to this extent results from the inclusion of these rods in the electrical apparatus industry.

Table 12. - AVAILABLE STATISTICS ON THE CONSUMPTION OF COPPER IN SPECIFIED CANADIAN INDUSTRIES, 1937 and 1938 - Concluded.

Industry	(Item (Used)	1937	1938
White Metal Alloys	(Scrap (all kinds).....lb.	2,029,900	2,162,197
	(Copper.....lb.	51,253	51,017
	(Castings.....lb.	165,963	89,121
	(Ingots, slabs, wire bars, etc.....lb.	866,281	669,615
	(Rods.....lb.	34,367,135	24,152,604
	(Scrap.....lb.	170,463	42,751
Electrical Apparatus and Supplies.....	(Tubing and pipe.....lb.	427,010	322,969
	(Sheets and plates.....lb.	570,893	353,806
	(Wire, bare.....lb.	5,357,119	4,955,851
	(Wire, enamelled..... \$	546,076	395,887
	(Wire, other insulated..... \$	954,553	821,389
Iron and Steel and Their Products.....	Copper sheets, bars, etc.. lb.	7,696,884	4,939,785

Note: Corresponding data for 1939 not yet complete.

Table 13. - LEAD SMELTING CAPACITY OF CANADA.

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

LEAD REFINING CAPACITY OF THE WORLD, 1939.

(American Bureau of Metal Statistics)

The lead refining capacity of the world, as at the end of 1939, aggregated about 1,072,000 short tons in the United States and about 2,174,000 elsewhere, a grand total of about 3,246,000 tons.

Probably not more than 950,000 tons of the listed capacity in the United States and 1,550,000 tons elsewhere, a total of 2,500,000 tons, is to be rated as useful and effective, the remainder being obsolete, incapable of economical ore supply, or otherwise useless. These accountings are exclusive of capacity in Russia.

Official data for 1938 were not received from Spain, Germany and Japan, and for 1939 there was an absence of communication for other countries.

Table 14. - PRODUCTION IN CANADA, IMPORTS AND EXPORTS OF LEAD, 1938 and 1939.

	1938		1939	
	Pounds	Value	Pounds	Value
PRODUCTION -		\$		\$
Nova Scotia.....	...	...	2,545,122	80,655
Ontario.....	22,363	748	39,130	1,240
British Columbia.....	413,706,307	13,834,339	378,440,666	11,992,784
Yukon.....	5,198,990	173,854	7,544,632	239,089
TOTAL.....	418,927,660	14,008,941	388,569,550	12,313,768

Table 14.- PRODUCTION IN CANADA, IMPORTS AND EXPORTS OF LEAD, 1938 and 1939-Concl'd.

	1 9 3 8		1 9 3 9	
	Pounds	Value \$	Pounds	Value \$
IMPORTS -				
Old and scrap, pig and block.....	56,416	3,235	16,846	1,822
Bars and sheets.....	54,507	2,948	88,092	5,442
Litharge.....	2,125,900	143,597	2,253,300	154,898
Acetate of lead.....	245,949	14,493	164,717	10,469
Nitrate of lead.....	285,303	16,250	286,801	20,860
Other manufactures.....	-	67,228	-	80,338
Pipe lead.....	28,333	1,671	69,525	3,798
Shots and bullets.....	9,023	634	11,726	974
Tea lead.....	-	-	-	-
Lead arsenate.....	496,387	41,620	568,344	49,238
Lead tetraethyl, compounds of.....	5,486,418	2,485,032	6,373,494	2,927,449
Lead capsules for bottles.....	-	65,029	-	78,652
Lead pigments -				
Dry white lead.....	91,025	5,592	8,324	701
White lead, ground in oil.....	9,928	916	14,769	1,562
Dry red lead and orange mineral...	453,721	31,593	450,885	31,619
TOTAL.....	-	2,879,838	-	3,367,822
EXPORTS -				
Lead, contained in ore.....	7,162,300	345,394	8,204,200	399,811
Pig lead.....	309,864,100	8,637,797	361,471,700	9,450,265
White lead.....	70,400	5,712	256,700	20,931
TOTAL.....	317,096,800	8,988,903	369,932,600	9,871,007

Table 15. - AVAILABLE STATISTICS ON THE CONSUMPTION OF LEAD IN SPECIFIED CANADIAN MANUFACTURING INDUSTRIES, 1937 and 1938.

Industries	Items Used	1 9 3 7	1 9 3 8
		Lb.	Lb.
Brass and copper products...	(Pig lead.....	804,379	712,315
	(Scrap and other lead.....	306,379	468,372
Paints and pigments.....	(Pig lead (x).....	14,442,025	13,720,025
White metal alloys.....	(Pig lead.....	10,818,139	11,875,116
	(Scrap lead.....	12,082,034	12,230,944
Electrical apparatus.....	(Pig lead.....	21,054,881	21,467,082
	(Scrap lead.....	129,400	154,125
	(Lead sheets, etc.....	798,603	874,760
Iron and steel.....	(Lead.....	1,810,495	1,306,444
Explosives.....	(Pig lead.....	1,024,749	794,098
GRAND TOTAL.....		63,271,084	63,603,281

(x) Some products, such as lead oxides made from pig lead by the paints and pigments industry are sold to other industries for the manufacture of such products as storage batteries.

Table 16 - PRODUCTION OF REFINED LEAD IN CANADA, 1931 - 1939.

Year	Pounds	Year	Pounds
1931.....	278,448,457	1935.....	327,515,277 (A)
1932.....	253,136,522	1936.....	363,449,490 (A)
1933.....	254,565,861	1937.....	399,394,939 (A)
1934.....	314,457,735(A)	1938.....	400,763,914 (A)
		1939.....	381,137,424 (A)

(A) Primary lead only.

Table 17.-CAPACITY AND PRODUCTION OF ELECTROLYTIC ZINC PLANTS IN CANADA, 1937 - 1939.

Company	Maximum H.P. used (a)	Estimated annual capacity for cathode zinc (short tons) (b)	Actual production as ingot zinc (short tons)		
			1 9 3 7	1 9 3 8	1 9 3 9
Consolidated Mining & Smelt- ing Co. of Canada Ltd.....	72,000	146,000	124,157	133,242	(c)
Hudson Bay Mining & Smelting Co. Ltd.....	22,500	43,000	34,486	38,414	38,790

NOTE - This statement supplied by the American Bureau of Metal Statistics.

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

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

(c) Not recorded.

The American Bureau of Metal Statistics estimates the capacity of American zinc metallurgical works at the end of 1939 as being nominally for the production of about 600,000 short tons of spelter per annum by distilling, including the capacity in continuously operating vertical retorts, and about 214,000 tons by electrolysis, a total of about 814,000 tons, but the first-class effective capacity is probably something less than that. The effective capacity outside the United States at the end of 1939 is estimated at about 1,212,000 metric tons whereof about 330,000 tons were in Australia, Canada, Rhodesia and Great Britain.

Table 18. - PRODUCTION IN CANADA, IMPORTS AND EXPORTS OF ZINC, 1938 and 1939.

	1938		1939	
	Pounds	Value \$	Pounds	Value \$
PRODUCTION -				
Nova Scotia.....	-	-	9,152,856	280,901
Quebec.....	5,315,852	163,356	28,758,759	882,606
Ontario.....	-	-	-	-
Manitoba.....	46,864,575	1,440,148	40,302,747	1,236,891
Saskatchewan.....	29,962,597	920,751	37,278,001	1,144,062
British Columbia.....	299,363,564	9,199,443	279,041,497	9,563,784
Total.....	381,506,588	11,723,698	394,533,860	12,108,244
IMPORTS -				
Zinc dust.....	1,373,900	70,294	1,301,900	80,571
Zinc in blocks, pigs, bars and rods, and zinc plates, n.o.p...	5,900	643	38,500	3,347
Zinc in sheets and strips, and zinc plates for marine boilers.	6,771,600	467,114	7,004,300	547,514
Zinc spelter.....	2,700	201	1,200	96
Zinc white (zinc oxide).....	12,492,235	489,850	10,539,650	450,954
Zinc sulphate.....	585,362	8,977	566,118	14,037
Zinc, chloride of.....	1,252,081	48,720	2,128,454	84,290
Zinc, manufactures of n.o.p.....	-	206,948	-	283,127
Lithopone.....	17,731,703	632,273	21,252,814	765,522
Total - Imports.....	-	1,925,020	-	2,229,458
EXPORTS -				
Zinc, contained in ore.....	45,841,000	1,154,812	41,260,600	526,905
Zinc, scrap, dross and ashes....	2,364,100	34,235	3,918,500	51,741
Zinc spelter.....	264,424,100	8,626,961	311,989,100	9,343,586
Total - Exports.....	312,629,200	9,816,008	357,168,200	9,922,232

Table 19. - REFINED NEW ZINC PRODUCED IN CANADA, 1931 - 1939.

Year	Short tons	Year	Short tons
1931	118,622	1936	151,103
1932	86,141	1937	158,542
1933	91,946	1938	171,932
1934	134,917	1939	175,641
1935	149,523		

Table 20. - AVAILABLE STATISTICS ON THE CONSUMPTION OF ZINC AND ZINC PRODUCTS IN SPECIFIED CANADIAN MANUFACTURING INDUSTRIES, 1937 and 1938.

Industry	Items Used	1937	1938
	Metal	Lb.	Lb.
	(Other zinc.....	271,312	286,395
Brass and copper products.	(Zinc ingots and slabs.....	5,938,523	4,540,598
	(Zinc scrap.....	71,137	47,632
	(Zinc spelter.....	2,422,336	2,256,403
White metal alloys.....	(Zinc scrap.....	951,995	627,551
	(Zinc ingots and bars.....	880,619	1,117,940
Electrical apparatus.....	(Zinc sheets.....	2,712,989	2,319,830
Acids,alkalies and salts..	(Zinc, Metal.....	3,584,568	2,717,080
Iron and steel.....	Zinc.....	26,913,053	26,442,237
Miscellaneous chemicals...	Zinc sheet.....	68,947	81,922
GRAND TOTAL - METAL.....		43,815,479	40,437,588
	Products		
	(Zinc oxide.....	2,619,194	2,616,269
Paints and pigments.....	(Leaded zinc oxides and zinc leads.....	3,538,049	3,653,872
	(Lithopone (x).....	14,322,160	14,235,197
Electrical apparatus.....	Zinc chloride.....	423,498	436,562
Toilet preparations.....	(Zinc oxide.....	61,334	41,580
	(Zinc stearate.....	25,680	17,435

(x) A mixture of zinc sulphide and barium sulphate prepared by precipitation.

Table 21 - WORLD PRODUCTION OF NICKEL ORE, 1935 - 1939. / (In terms of metal).

Country	1935	1936	1937	1938	1939
	(short tons)				
Canada (a).....	69,258	84,870	112,453(e)	105,286	113,053
New Caledonia (b).....	5,800	5,400	6,600	8,500	5,300(h)
Greece (d).....	1,200	1,380	1,160	(f)	(f)
Burma (c).....	1,640	1,447	1,345	1,050	860(g)
Norway.....	1,677	1,400	968	1,373	1,400
Russia.....	2,016	(f)	(f)	(f)	(f)

(a) Production in all forms from Canadian ores. (e) Not including production in

(b) Estimated content of ore and matte exported. British Columbia.

(c) Nickel content of speiss obtained as a by-product. (f) Not yet reported.

(d) Nickel and cobalt content beginning 1934. (g) January-September only.

(h) January-July only.

/ American Bureau of Metal Statistics.

Table 22. - WORLD PRODUCTION OF ALUMINIUM (Supplied by the American Bureau of Metal Statistics).
(in metric tons)

Country	1922	1929	1932	1936	1937	1938
United States	33,600	102,100	47,600	102,028	132,759	130,129
Canada.....	10,000	42,000	18,000	26,900	42,500	66,000
Europe (a).....	48,200	137,198	87,769	233,081	304,521	366,895
Japan.....	...	...	...	6,664	10,000	20,000(x)
TOTAL FOR WORLD.....	91,800	281,298	153,369	368,673	489,830	583,024

NOTE: Omitted from this table is a small production in Yugoslavia.

(a) German output in 1938 (including Austria) was 165,700 metric tons.

(x) Conjectural.

Data for 1939 not complete.

Canadian silver production in 1938 totalled 23,163,629 fine ounces valued at \$9,373,490. The Dominion in 1938 ranked third as a world silver producing country.

Table 23 - OTHER NON-FERROUS PRODUCTS PRODUCED IN CANADIAN SMELTERS AND REFINERIES, 1938 and 1939.

	Unit	1938		1939	
		Quantity	Value	Quantity	\$
Antimony.....	lb.	-	-	1,200,180	148,330
Arsenic (As ₂ O ₃).....	lb.	2,175,646	56,538	1,741,917	52,257
Bismuth.....	lb.	9,516	9,754	409,449	466,362
Cadmium.....	lb.	699,138	561,799	939,691	662,209
Cobalt (a).....	lb.	459,226	790,913	732,561	1,213,454
Palladium, rhodium, iridium, etc. (b)	oz.	130,893	3,677,342	135,402	4,199,622
Platinum (b).....	oz.	161,326	5,196,794	148,877	5,221,712
Radium, uranium (products).....	\$	(d)	(d)	(d)	1,121,553
Selenium.....	lb.	358,929	622,742	150,771	266,714
Tellurium.....	lb.	48,237	82,967	2,940	4,769
Sulphur (c).....	ton	112,395	1,044,817	211,278	1,668,025

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

(b) Final refining conducted in Europe.

(c) Sulphur recovered from smelter gases as elemental sulphur and in sulphuric acid and ammonium sulphate made. Also includes sulphur in iron pyrites exported.

(d) Not published.

In addition there were 436 pounds of mercury metal valued at \$1,226 produced at a mine in British Columbia in 1939.

Table 24.-SOURCE OF CANADIAN FINE GOLD PRODUCTION, BY PERCENTAGES, 1932, 1933, 1936-1939.

	1932	1933	1936	1937	1938	1939
	%	%	%	%	%	%
In alluvial gold.....	1.8	2.0	2.27	2.20	2.50	2.47
In crude gold bullion (A).....	79.3	79.8	77.37	80.20	80.80	82.14
In base bullion (from silver-lead ores, etc.)	1.0	0.7	1.60	0.90	0.92	0.63
In blister and anode copper.....	15.1	14.2	13.80	11.70	11.24	10.36
In ores, matte, slags, etc., exported.....	2.8	3.3	4.96	5.00	4.54	4.40
	100.0	100.0	100.00	100.00	100.00	100.00

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

Canadian gold production in 1939 totalled 5,094,379 fine ounces valued in Canadian currency at \$184,115,951. Canada in 1939, as a gold producing country, was surpassed only by the Union of South Africa and possibly Russia. The origin of Canadian production is shown in the above table.

DIRECTORY (1939)

<u>Name of Company</u>	<u>Head Office Address</u>	<u>Canadian Plant Location</u>
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CANADIAN COPPER SMELTING COMPANIES

Noranda Mines Ltd.	2 King St. E., Toronto, Ont.	Noranda, P.Q.
(a) International Nickel Co. of Canada, Ltd.	Copper Cliff, Ontario.	Copper Cliff, Port Colborne & 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, 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.
International Nickel Co. of Canada, Ltd.	Copper Cliff, Ont.	Copper Cliff, Ont.
(c) Produce refined copper, silver, gold, tellurium and selenium.		

CANADIAN LEAD SMELTING AND REFINING COMPANIES

Consolidated Mining & Smelting Co. of Canada Ltd. (A)	215 St. James St. W., Montreal, P.Q.	Trail, B.C.
(A) Produce bismuth or bismuth-bearing bullion as by-products, also gold, silver, antimony and sulphur.		

CANADIAN ELECTROLYTIC ZINC REFINING COMPANIES (x)

Consolidated Mining and Smelting Co. of Canada Limited.	215 St. James St. W., Montreal, P.Q.	Trail, B.C.
Hudson Bay Mining & Smelting Co. Ltd.	Woodstock, Ont.	Flin Flon, Man.

CANADIAN SMELTERS AND REFINERS OF COBALT-ARSENIC ORES

Deloro Smelting & Refining Co. Ltd. (xx)	Deloro, Ont.	Deloro, Ont.
(xx) Produce silver, cobalt, arsenic, bismuth, nickel oxide and cobalt oxide and salts.		

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

Aluminum Company of Canada, Ltd.	Canada Life Building, 340 University Ave., Toronto 2, Ont.	Arvida and Shawinigan Falls, P.Q.
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NOTE - In addition to the companies listed above, the Chromium Mining & Smelting Corp. Ltd., treated foreign chromite ores at Sault Ste. Marie, Ontario.

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