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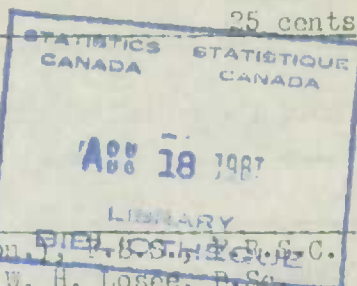
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DEPARTMENT OF TRADE AND COMMERCE
DOMINION BUREAU OF STATISTICS
MINING, METALLURGICAL AND CHEMICAL BRANCH
OTTAWA - CANADA



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THE NON-FERROUS SMELTING AND REFINING INDUSTRY IN CANADA, 1943

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 net value added by the industry in the processing of crude or semi-crude material during 1943 totalled \$111,857,020 compared with \$125,831,047 in the preceding year. Refined products included gold, silver, nickel, copper, lead, zinc, aluminium, tin, magnesium, antimony, bismuth, cobalt, cadmium, selenium, tellurium, pitchblende products and sulphur; other end products of individual plants or companies were copper-nickel matte, copper matte, cobalt salts, nickel salts, nickel and cobalt oxides, arsenious oxide, sulphuric acid, platinum metals residues, zinc dust, zinc oxide, and blister and anode copper.

This value added in 1943 represents a 12.3 per cent decrease from the all time high record of \$125,831,047 in 1942. This does not altogether reflect a general decrease in metal output but rather the gradual increase in mining, smelting and transportation costs resulting from prolonged war-time conditions. The total costs of both foreign and domestic ores, concentrates, matte etc., treated in all Canadian non-ferrous metallurgical plants during 1943 was estimated at \$317,917,136 compared with \$258,903,318 in 1942. It should be noted, in a study of these data, that companies operating both mines and smelters may vary from year to year the nominal values of crude ores etc., shipped from their mines to their own smelters, with the result that in some years the mining industry proper is favoured economically at the expense of the non-ferrous smelting and refining industry and vice versa. The total annual net value of commodity production for the nation as a whole is, however, not affected by these arbitrary (internal) evaluations.

Fuels and purchased electricity consumed by the industry in 1943 totalled \$45,105,101 compared with \$35,748,639 in 1942. The value of chemicals and other process supplies consumed during the year under review amounted to \$33,334,069 as against \$27,083,695 in the preceding year.

Capital employed during 1943 by the non-ferrous smelting and refining industry was reported at \$392,217,159, which figure includes the value of land, plant, material on hand and in process, finished products and operating funds, the very great expansion in new plant construction and production since the commencement of the war may be realized in a comparison of this total with the corresponding figure of \$192,186,465 for 1939.

Employees during 1943 totalled 26,749 compared with 21,162 in 1942. Salaries and wages paid in 1943 amounted to \$48,491,732 as against \$37,340,566 in the preceding year. It is interesting to note that female wage-earners employed

increased from an average of 185 in 1942 to 797 in 1943.

Table 1 - PRINCIPAL STATISTICS OF THE NON-FERROUS METALLURGICAL INDUSTRY IN CANADA,
1941 - 1943

	1941	1942	1943 ^{1/}
Number of companies	9	10	9
Number of plants	13	15	16
Capital employed \$	309,963,342	356,052,965	392,217,159
Number of salaried employees	1,750	2,625	3,375
Salaries \$	4,117,398	5,286,755	7,160,290
Number of wage-earners	14,264	18,537	23,374
Wages \$	23,365,291	32,053,801	41,331,442
Value of plant products (gross) (x) . \$	379,322,270	447,617,199	511,213,376
Estimated cost of ores, concentrates, etc., treated (a) \$	213,542,005	253,903,813	317,917,136
Cost of fuel and purchased electri- city (b) \$	26,771,309	35,743,639	43,105,101
Process supplies, other than items (a) and (b) \$	19,272,132	27,083,695	33,334,069
Value added by smelting (net) (d) ... \$	119,736,294	125,881,047	111,857,020

(x) 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 represents a duplication in values.

(d) See preceding text.

^{1/} Data in this report for 1943 do not include those relating to the Eldorado Mining and Refining Ltd.

Table 2 - NUMBER OF WAGE EARNERS, BY MONTHS, 1932 and 1939-1943

Month	1932	1933	1940	1941	1942		1943	
					Male	Female	Male	Female
January ...	5,496	11,138	11,225	12,927	15,776	31	22,322	522
February ..	5,400	11,123	11,297	13,052	16,298	32	23,120	560
March	5,355	11,334	11,298	13,102	16,434	34	23,039	653
April	4,750	11,371	11,403	13,617	16,617	39	22,788	727
May	4,297	11,330	11,691	14,275	17,223	53	22,532	773
June	4,475	11,390	11,794	14,503	18,297	63	22,963	843
July	4,205	11,486	12,102	14,634	18,900	75	22,735	886
August	4,160	11,476	12,256	14,788	19,346	81	22,538	917
September .	4,198	11,454	12,251	14,315	19,091	206	22,186	943
October ...	4,326	11,327	12,316	14,995	20,076	424	21,856	938
November ..	4,316	11,401	12,481	15,055	20,953	570	22,337	904
December ..	4,274	11,424	12,771	15,371	21,239	605	22,393	903
AVERAGE ...	4,604	11,360	11,903	14,264	18,352	185	22,577	797

Non-Ferrous

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Table 3 - FUEL AND ELECTRICITY USED IN THE NON-FERROUS SMELTING AND REFINING INDUSTRY, 1942 and 1943

Kind	Unit of measure	For light and power		For metallurgical purposes	
		Quantity	Cost	Quantity	Cost
			\$		\$
<u>1 9 4 2</u>					
Bituminous coal -					
Canadian	short ton	31,187	145,250	363,573	2,641,001
Imported	short ton	53,327	402,330	589,103	4,405,409
Anthracite coal -					
United States	short ton	3	45	69	1,020
Other	short ton	...	...	40	436
Coke	short ton	1,258	12,255	372,737	4,093,027
Gasoline	Imp.gal.	220,474	78,637	143,363	47,335
Kerosene or coal oil ..	Imp.gal.	8,623	1,847	2,045	480
Fuel oil and diesel oil	Imp.gal.	173,509	20,304	33,588,391	2,579,779
Wood (cords or 128 cubic feet)	cord	505	4,258	5,687	23,589
Gas - Manufactured	M cu.ft.	...	...	853,565	12,883
Natural	M cu.ft.	...	...	3,138	3,207
Other fuel .....	...	...	...	429	348
Electricity purchased .	K. W. H.	848,227,671	2,362,001	7,439,533,174	13,906,148
TOTAL .....	...	...	3,027,427	...	32,721,212
Electricity generated for own use (x)	K. W. H.	9,915,356	...	243,303,225	...
Process supplies used, chemicals, etc.	\$		27,083,635		
<u>1 9 4 3</u>					
Bituminous coal -					
Canadian	short ton	42,756	250,645	420,616	3,530,176
Imported	short ton	43,634	344,161	723,644	5,793,090
Anthracite coal -					
United States	short ton	...	...	245	3,393
Other	short ton	...	...	...	...
Coke	short ton	1,407	14,451	372,105	4,312,298
Gasoline	Imp.gal.	194,547	60,582	145,614	44,642
Kerosene or coal oil ..	Imp.gal.	36,843	7,144	1,363	334
Fuel oil and diesel oil	Imp.gal.	136,954	25,575	43,714,391	3,446,325
Wood (cords of 128 cubic feet)	cord	378	3,083	5,972	26,062
Charcoal	lb.	...	...	1,471,455	24,366
Gas - Manufactured	M cu.ft.	...	...	4,434	5,300
Natural	M cu.ft.	...	...	353	362
Electricity purchased .	K. W. H.	346,724,889	2,629,735	10,163,115,233	22,582,377
TOTAL .....	...	...	3,335,376	...	39,769,725
Electricity generated for own use (x)	K. W. H.	8,634,654	...	261,743,436	...
Process supplies used, chemicals, etc.	\$		38,334,069		

(x) In addition, 23,473,768 K.W.H. valued at \$93,691 were generated for sale by the industry in 1942 and 25,030,900 K.W.H. valued at \$96,517 in 1943.

Table 4 - POWER EMPLOYED IN THE NON-FERROUS SMELTING AND REFINING INDUSTRY, 1943

Description	Ordinarily in Use		In Reserve or Idle	
	Number of units	Total horse power	Number of units	Total horse power
1. Steam engines	25	2,556	1	1,074
2. Steam turbines	7	13,220	3	2,515
3. Diesel engines	15	8,361	2	175
4. Gasoline, gas and oil engines, other than Diesel engines	22	2,008	1	60
5. Hydraulic turbines or water wheels .	11	51,125	...	...
6. Electric motors (except those reported under item 7) -				
(a) Operated by purchased power ..	11,322	374,475	1,236	29,003
Total (1), (2), (3), (4), (5) and (6a).	12,002	451,745	1,235	32,827
(b) Operated by power generated by 1, 2, 3, 4 and 5	328	4,153	25	344
7. Stationary boilers	54	30,100	11	6,750
8. Motor generator sets	212	126,633	13	7,432

Table 5 - AVERAGE ANNUAL METAL PRICES, IN CANADIAN DOLLARS, 1929-1943

Year	Gold	Silver	Copper	Lead	Zinc
	Troy oz.	Troy oz.	Pound	Pound(✓)	Pound(✓)
	\$	\$	\$	\$	\$
1929	20.67	0.530	0.130(x)	0.050	0.054
1930	20.67	0.381	0.130(x)	0.039	0.036
1931	21.55	0.298	0.0837(x)	0.027	0.025
1932	23.47	0.317	0.0638	0.021	0.024
1933	28.60	0.373	0.0745	0.024	0.032
1934	34.50	0.475	0.0742	0.024	0.030
1935	35.19	0.648	0.0730	0.031	0.031
1936	35.03	0.451	0.0948	0.039	0.035
1937	34.99	0.449	0.131	0.051	0.0490
1938	35.17	0.435	0.0997	0.034	0.031
1939	36.14	0.405	0.101(✓)	0.032	0.031
1940	38.50	0.382	0.101	0.034	0.034
1941	38.50	0.3826	0.101	0.034	0.034
1942	38.50	0.4216	0.101	0.034	0.034
1943	38.50	0.4525	0.1175	0.375	0.040

(x) Based on New York; 1932-1942 based on London.

(✓) Based on London; prices controlled by Government since 1939 and subject to revision since 1939.

The 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, was continued with some adjustments or revisions for increases in prices due to the increased cost of labour and materials. Canada can now furnish large quantities of these metals in the refined state, whereas in 1914 no refined copper, nickel or zinc and only a comparatively small amount of refined lead were produced in this country.

Tables of world metal production were omitted from this report due to the fact that recent data for most countries were unobtainable or conjectural in nature; also, data relating to capacities of Canadian metallurgical plants have been withheld for confidential use only until the termination of the war.

The following information has been abstracted from the 1943 annual reports of some of Canada's more important mining and metallurgical companies:

Canadian Copper Refiners Limited - Montreal East - Quebec - "Except for a short period at the beginning of the year, the refinery continued to operate at full capacity during 1943. A new building for the production of selenium compounds and the housing of a new Research Laboratory is under construction. Sales of selenium and selenium compounds increased considerably. This expansion has been accelerated by war demand and research, resulting in finding new uses for this metal. In April 1944 it was hoped that work might start soon on a plant for the production of copper sulphate. Canada is presently dependent upon Great Britain and the United States for its supply of copper sulphate, which is essential in agriculture, base metal production, the processing of pulp and paper and in numerous other fields."

Noranda Mines Limited - Noranda, Quebec - "During 1943, the smelter treated 1,380,738 tons of ore, concentrate and slag, including 428,073 tons of custom ores and concentrates, and produced 137,466,835 pounds of anodes. After deducting the copper, gold and silver which was recovered from slags received from various shippers, the estimated production of new metals was 132,762,100 pounds of fine copper, 333,261 ounces of gold and 1,516,506 ounces of silver. The estimated recovery from Horne mine ore and concentrate was 66,104,400 pounds of copper, 269,732 ounces of gold and 660,780 ounces of silver. During the year under review the concentrator treated 1,090,166 tons of ore from the Horne mine, from which 187,862 tons of copper-gold concentrate were produced and sent to the smelter. The cyanide mill treated 210,205 tons of pyrite from the flotation circuit tailing, from which 14,430 ounces of gold were recovered. 186,635 tons of pyrite were recovered from the cyanide mill tailing and sold to chemical plants."

Aluminum Company of Canada Limited - "The ore plant producing bauxite concentrates was in continuous operation at Arvida, Quebec, throughout 1943. Aluminum ingots were produced during the year under review at Arvida, Shawinigan Falls, La Tuque, Beauharnois and Isle Maligne, all in the Province of Quebec. The Beauharnois and Isle Maligne plants are new, coming into production for the first time in 1943. Production of aluminum in all plants of the company during 1943 totalled 991,499,296 pounds or an increase of 498 per cent over the output of 165,680,869 pounds in 1939. Canada is now firmly established as one of the world's greatest producers of aluminum a fact largely attributable to the immense water power resources of the Dominion."

International Nickel Company of Canada Limited - "Since the outbreak of war in 1939, the objective of this company has been to meet effectively the war-time requirements of the governments in Ottawa, London and Washington. We have striven to provide the maximum supply of nickel and nickel products, copper and platinum metals and through our technical knowledge of uses to assist in directing the supplies into those fields of application where they would be of greatest value.

"Our central effort has been to expand the supplies of nickel. Deliveries of nickel in all forms derived from our own mine production amounted in 1943 to 265,000,000 pounds, representing an increase of 55,000,000 pounds over 1939. In order to provide this enlarged supply, the tonnage of our ore mined was forced from 7,273,000 tons in 1939 to 12,105,000 tons in 1943. Had it not been for shortage of

man-power during the last six months of the year the production would have been appreciably higher. As an emergency war measure we have also refined a volume of nickel originating from the mines of others. Our own deliveries, together with this volume refined for others, totalled nearly 300,000,000 pounds.

"The company's output of copper has been subordinated to the war needs for expanded nickel production. Deliveries of our copper in all forms amounted to 265,000,000 pounds, comparable with 334,000,000 pounds in 1939. Our own deliveries, together with the volume of copper which we refined for others, totalled nearly 316,000,000 pounds. Deliveries of platinum metals reached the highest level in the company's history. Deliveries of gold and silver amounted to 58,331 ounces and 1,768,052 ounces respectively and of selenium and tellurium 80,984 pounds and 6,773 pounds respectively. During the war the technical and operating resources of the company have been devoted also to the production of a variety of special war material."

Deloro Smelting and Refining Co. Ltd., Deloro, Ontario - "The plant of the company located at Deloro, Ontario was in continuous operation throughout 1943. No Canadian silver-cobalt ores were smelted during the year, however the company treated a considerable tonnage of cobaltiferous residues received from Africa. Products in 1943 included cobalt metal, cobalt oxide, cobalt salts and cobalt alloys. A relatively large quantity of refined arsenic was produced in 1943 from crude arsenic obtained from gold mines in the Province of Quebec."

Eldorado Mining and Refining Limited - Port Hope, Ontario - "War-time restrictions prevent the publication of data relating to the production of pitchblende products in this plant."

Falconbridge Nickel Mines Limited - "Operation in 1943 of the treatment plants at Falconbridge in the Sudbury area of Ontario was satisfactory throughout the year. For the first quarter the operation followed the same pattern as for the preceding year. However, during the remainder of the year, a marked improvement in metallurgical efficiency was experienced due to the greater flexibility afforded by increased smelting capacity. The result is shown by a comparison of the last nine months of the year with a like period in 1942, which indicates that, while tonnage treated increased but little over 5 per cent the production was about 11 per cent higher with no change in grade of ore. After deducting 326 tons of waste picked, and applying adjustments in above-ground storage there were 807,048 tons of ore treated comprising 514,714 tons of milling grade and 292,324 tons of smelting grade-matte produced totalled 22,699.4 short tons containing 11,597.4 short tons of nickel and 6,046.6 short tons of copper metals, recovered per ton treated totalled 28.74 pounds nickel and 14.98 pounds of copper. Falconbridge matte is shipped to the Canadian plants of the International Nickel Company of Canada Limited."

Dominion Magnesium Limited - "The plant of this company located at Haley near Renfrew, Ontario was in continuous operation during the entire year. Products included both magnesium ingots and magnesium alloys. The metal is recovered from dolomite rock by the ferrosilicon process. The average number of employees during the year totalled 403 of whom 25 were females."

Hudson Bay Mining and Smelting Co. Limited - Flin Flon, Manitoba - "The tonnage of ore milled and the production of blister copper and slab zinc were the highest for any year on record while the production of gold and silver was only exceeded in 1942. Cadmium production was the highest it has been in any year since stockpiles of residues were depleted and production depended solely on treatment of current zinc purification residue. The tonnage of ore mined and hoisted

from underground totalled 2,258,638 assaying 0.113 ounces gold; 1.88 ounces silver; 2.44 per cent copper and 5.5 per cent zinc. Included in the above were 18,441 tons of direct smelting ore. From 2,241,142 tons of ore milled there were produced 415,810 tons copper concentrates assaying 0.407 ounces gold; 7.23 ounces silver and 11.53 per cent copper and 180,970 tons of zinc concentrates assaying 0.068 ounces gold; 1.71 ounces silver; 0.46 per cent copper and 46.1 per cent zinc. The average percentage of recovery of copper in copper concentrates and the average percentage of recovery of zinc in the zinc concentrates during 1943 were the highest on record. The tonnage of flotation tailings treated in the cyanide plant during 1943 was 1,539,713 from which were recovered 22,119 ounces gold, 225,388 ounces silver and 79,999 pounds copper; this material was sent to the copper converter and included in the blister copper produced in the smelter. In 1943 the company produced 108,496,410 pounds of slab zinc. After allowing for metals due on account of custom concentrates the company shipped in 1943 for its own account 192,884 ounces gold, 3,127,331 ounces silver, 92,357,369 pounds copper and 141,733 pounds of selenium.

"The average number of employees at Flin Flon during 1943 was 2,217. The labour shortage was such during the middle of the year that most underground development work had to be discontinued and construction work curtailed. Temporary employees from the farms relieved the situation for the winter. Each year recently has seen an increase in the number of women employees, and at the end of the past year there were 220 on the payroll. There are only one-third of the employees now working who were with the company at the beginning of the war."

Consolidated Mining and Smelting Company of Canada Limited - Trail, B.C. -

"Compared with 1942, the production of refined metal from Trail plants showed a substantial reduction due to the falling off in ore receipts from the Sullivan mine. Production costs increased due to lower output and the shortage of experienced men. For these reasons, the metallurgical recoveries were slightly lower. The accident record showed some improvement over 1942, the shifts lost per one thousand worked being 5.7.

"Production of refined lead was 224,493 tons or about 19,000 tons less than in 1942. The zinc plant produced 152,299 tons of bar zinc, or about 13,000 tons less than in 1942. The antimony plant was closed from the first of the year until the middle of June due to shortage of labour; consequently the year's production of antimony was only 557 tons. The sulphur plant was closed in July as the maximum output of sulphuric acid was required for fertilizers. The production of sulphuric acid at 269,394 tons was 76,000 tons above the previous record in 1942.

"In March 1943 the production of ore from the Sullivan mine reached a record high of 243,631 tons. The tonnage decreased steadily until October when the mine produced only 170,282 tons of ore. The decline in production was chiefly due to shortage of labour. This shortage affected the rate of ore extraction and caused development work to lag behind production. For the first time in some years development work was insufficient to maintain ore reserves, 1,600,000 more tons being mined than were actually developed during the year. Shipments of iron concentrates for the production sulphuric acid at Trail were commenced from the mine in September.



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DIRECTORY OF FIRMS IN THE CANADIAN NON-FERROUS SMELTING AND REFINING INDUSTRY, 1946

<u>Name of Firm</u>	<u>Head or Executive Office Address</u>	<u>Location of Plant</u>
<u>Quebec</u>		
Aluminum Company of Canada Ltd.	1700 Sun Life Bldg., Montreal, Que.	Arvida, Shawinigan Falls, La Tuque, Isle Maligne, Beauharnois Montreal East
Canadian Copper Refiners Ltd.	1600 Royal Bank Bldg., Toronto, Ontario.	Montreal East
Noranda Mines Limited.	1600 Royal Bank Bldg., Toronto, Ontario.	Noranda
<u>Ontario</u>		
Deloro Smelting Refining Co. Limited.	Deloro, Ontario	Deloro
Dominion Magnesium Ltd.	67 Yonge St., Toronto, Ont.	Haley
Eldorado Mining and Refining	80 King Street, W., Toronto, Ontario.	Port Hope
Falconbridge Nickel Mines Ltd.	25 King Street W., Toronto, Ontario.	Falconbridge
International Nickel Co. of Canada Limited.	Copper Cliff, Ontario	Copper Cliff, Coniston, Port Colborne
<u>Manitoba</u>		
Hudson Bay Mining and Smelting Co. Limited.	500 Royal Bank Bldg., Winnipeg, Manitoba.	Flin Flon
<u>British Columbia</u>		
Consolidated Mining and Smelting Trail, B. C. Co. of Canada Limited.		Trail