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CANADA

DEPARTMENT OF TRADE AND COMMERCE

DOMINION BUREAU OF STATISTICS

CENSUS OF INDUSTRY

MINING, METALLURGICAL & CHEMICAL BRANCH

THE NICKEL-COPPER MINING, SMELTING AND NICKEL REFINING INDUSTRY IN CANADA 1938

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THE NICKEL-COPPER MINING, NICKEL-COPPER SMELTING and NICKEL REFINING INDUSTRY IN CANADA, 1938.

The production of new nickel in Canada during 1938 totalled 210,572,738 pounds valued at $53,914,494 compared with 224,905,046 pounds worth $59,507,176 in 1937. The entire production of Canadian nickel in 1938 originated in the nickel-copper ores of the Sudbury district, Ontario, and represented the recovery of the metal in the refined metallic state in salts and oxides and in matte exported. Copper recovered in 1938 from these same ores totalled 308,706,996 pounds valued at $30,373,280 and comprised the metal contained in converter copper produced in Canada together with the copper content of matte exported. The nickel-bearing deposits of the Sudbury area also contain relatively high values in platinum metals and the recoveries of these metals in 1938 were the largest ever realized in the history of the Canadian nickel-copper mining industry.

In addition to production of nickel, copper and the platinum metals there is an increasing output from these ores of the associated metals - silver, gold, selenium and tellurium; sulphur for the manufacture of sulphuric acid is also recovered in the gaseous state from waste smelter gases. The total gross value of the various primary products of the Canadian industry, considered as a whole, was estimated at $96,309,239 in 1938 compared with a corresponding value of $111,353,066 in the preceding year. It is also interesting to note that silver recovered from the Sudbury nickel-copper ores totalled 2,505,129 fine ounces in 1938 and represented 11.27 per cent of the total silver produced by the entire Canadian mining industry. Gold recovered from Canadian nickel-copper ores totalled 80,227 fine ounces in 1938. In 1926 the corresponding production of this metal, recorded as being recovered from this source, was only 4,447 ounces.

Two companies operate both mines and metallurgical plants in the Sudbury area. The International Nickel Co. of Canada, Limited, conducts smelting operations at Copper Cliff and Coniston, Ontario, while the Falconbridge Nickel Mines, Ltd., smelt their ores at the Falconbridge mine located a few miles east of the town of Sudbury. This last named company treat their matte in a refinery located at Kristiansand, Norway. The relatively small amount of nickel oxide produced at Deloro, Ontario, is recovered from silver-cobalt-nickel-arsenic ores mined in Northern Ontario. Smelter matte made by the International Nickel Co. of Canada, Limited, is treated in plants located at Clydach, Wales; Huntington, West Virginia, and at Port Colborne and Copper Cliff, Ontario.

The International Nickel Co. of Canada, Limited, reported that underground development was continued at the Frood, Creighton, Levack and Garson mines at a rate compatible with ore production requirements. The concentrator milled 4,519,652

tons of ore and the Copper Cliff smelter produced 182,904 tons of bessemer matte and 158,912 tons of converter copper. The Coniston smelter was operated continuously processing 832,906 tons of ore and producing 48,608 tons of bessemer matte. The nickel refinery of the company, located at Port Colborne, Ontario, produced 124,233,682 pounds of refined nickel of which 115,482,436 pounds were electrolytically refined. The copper refinery of the company's subsidiary - The Ontario Refining Company, Ltd. - received 158,793 tons of converter copper, transferred in a molten state from the Copper Cliff smelter, and produced 145,141 tons of refined copper. The output of nickel in pellet form at the Clydach, Wales, nickel refinery of the Mond Nickel Company, Ltd., was 43,962,458 pounds comparable with 39,554,965 pounds in 1937; in addition, 2,447,239 pounds of nickel were absorbed in the production of 11,821,980 pounds of nickel salts in 1938. The output of platinum metals and gold in the Acton, England, refinery increased during the year under review. The mine development programme by Petsamon Nikkeli O/Y (Mond Nickel Company, Ltd.) in Finland progressed satisfactorily; since 1933 expenditures on this property have totalled $2,975,373 and the construction of a smelting plant was actively under way in 1938.

The total number of employees of the International Nickel Co. of Canada, Limited (and associated companies) at the end of 1938 was 17,282, distributed as follows - Canada, 10,147; Great Britain, 3,490; United States, 2,121; Finland, 1,457, and other countries, 67. The retirement system for the benefit of employees, which is financed entirely by the company, completed its eleventh year of operation and 345 pensions and 68 death benefits were paid during 1938.

Proven ore reserves of the International Nickel Co. of Canada, Limited, at December 31, 1938, excluding Petsamon Nikkeli O/Y, were 212,368,000 short tons; the nickel-copper contents of the ore reserves are calculated to be 6,806,000 tons, an increase over 1937 of 67,000 tons.

Ore treated by Falconbridge Nickel Mines, Ltd., in 1938 totalled 490,938 tons comprising 252,866 tons of milling ore and 238,072 tons of smelting ore; matte produced amounted to 14,779.1 short tons containing 8,012.7 short tons of nickel and 4,108.5 short tons of copper. Metals recovered per ton of ore treated were - nickel, 32.64 pounds and copper, 16.74 pounds. Metallurgical losses per ton treated were 3.49 pounds nickel and 2.27 pounds copper; only 5,421 tons of waste was picked and discarded from hoisted ore. The Norwegian refinery of the Company operated steadily and normally throughout the year. The metals in Falconbridge matte received in 1938, less refinery losses, were - nickel, 15,803,958 pounds and copper, 7,840,033 pounds; there were produced in marketable form during the year 16,425,735 pounds of nickel and 8,250,642 pounds of copper. Ore reserves of Falconbridge Nickel Mines, Ltd., as of December 31, 1938, were reported at 6,881,000 tons averaging 1.80% nickel and 0.97% copper.

Development or exploration programmes were also conducted on nickel-copper deposits in the Sudbury area in 1938 by Nickel Offsets Ltd., Denison Nickel Mines, Ltd., and Anglo-Sudbury Nickel Corporation Ltd., while surface surveys were completed in the same district by the Ontario Nickel Corporation, Ltd., and Drury Nickel Mines Ltd..

In British Columbia the Western Nickel Corp. Ltd. carried on road construction near Yale and at Choate a maintenance crew was retained at the property of Pacific Nickel Mines Ltd..

Table 1 - PRINCIPAL STATISTICS OF THE NICKEL-COPPER MINING, SMELTING AND REFINING INDUSTRY IN CANADA, 1936 - 1938. (x)

	1936	1937	1938
Number of firms	5	(a)9	(f)9
Number of mines	9	12	12
Number of smelters	4	3	3
Number of nickel refineries	1	1	1
Capital employed	$ 97,838,133	104,313,953	111,947,698
Number of employees - On salary	293	323	329
On wages	8,469	10,435	10,075
Total	8,762	10,758	10,404
Salaries and wages .. Salaries	$ 922,545	1,075,552	1,114,511
Wages	$ 12,737,427	17,677,175	17,122,883
Total	$ 13,659,972	18,752,727	18,237,394
Fuel and purchased electricity used (c)	$ 5,679,676	7,454,717	6,675,789
Process supplies used (b)	$ 8,669,422	11,210,353	10,778,672
Estimated gross value of matte exported and Canadian refinery products (d)	$ 77,593,731	111,353,066	96,309,239
Value of production less items (b) and (c) ..	$ 63,244,633	92,687,996	78,854,778

(x) Does not include data for copper refineries, mines, power plants, etc., operated by subsidiary companies.
(a) 6 firms in Ontario, 2 in British Columbia, and 1 in New Brunswick.
(d) These data represent the values of products made in Canada from new or primary material only and do not include the value added in the electrolytic refining or other treatment of converter copper, scrap copper, customs ores, etc., in plants operated by subsidiary companies.
(e) In addition to the data shown in this table, there were approximately $1,297,000 distributed to some 770 employees engaged chiefly in Canada during 1938 in the refining of converter copper made from nickel-copper ores, also not included in Table 1 is a value of approximately $712,000 expended for process supplies in the refining of this particular converter copper.
(f) 7 firms in Ontario, 2 in British Columbia.

Table 2 - NUMBER OF WAGE-EARNERS EMPLOYED, BY MONTHS, 1932 - 1938.

Month	1932	1934	1936	1937	1938
January	3,014	4,811	8,076	9,302	10,540
February	3,019	4,876	8,044	9,572	10,528
March	3,039	5,048	8,103	9,840	10,501
April	2,577	5,189	8,191	10,118	10,429
May	2,379	5,409	8,257	10,458	10,314
June	2,434	5,622	8,411	10,762	9,965
July	2,235	5,658	8,653	11,009	9,766
August	1,672	5,566	8,804	11,036	9,752
September	1,628	5,500	8,606	11,048	9,847
October	1,580	5,722	8,700	10,760	9,943
November	1,490	5,707	8,735	10,695	9,690
December	1,551	5,609	9,050	10,578	9,589

Table 3 - NUMBER OF WAGE-EARNERS WHO WORKED THE NUMBER OF HOURS SPECIFIED, DURING ONE WEEK IN MONTH OF NORMAL EMPLOYMENT, 1938.

Hours per week	Number
30 hours or less	18
44 hours	198
45 - 47 hours	975
48 hours	9,256
49 - 50 hours	3
51 - 54 hours	1
56 - 64 hours	522
65 hours and over	6
Grand Total	10,979
Total Wages Paid in week to employees specified	$ 356,662

Table 4 - FUEL AND ELECTRICITY USED FOR LIGHT AND POWER, 1937 and 1938.

Kind	Unit of measure	1937 Quantity	1937 Cost at works	1938 Quantity	1938 Cost at works
			$		$
Bituminous coal - Canadian	short ton	4,140	24,648	1,528	9,693
Imported	short ton	14,077	86,951	19,112	121,426
Anthracite coal - United States	short ton	124	1,394	136	1,771
Other	short ton	128	2,005	154	2,464
Coke	short ton	253	2,553	147	1,450
Gasoline	Imp. gal.	56,503	12,471	51,840	11,121
Kerosene	Imp. gal.	4,852	986	8,790	1,744
Fuel oil and diesel oil	Imp. gal.	289,654	29,522	337,888	33,876
Wood	cord	321	1,315	20	80
Electricity purchased	K.W.H.	464,328,559	1,257,354	353,514,218	1,244,598
TOTAL	$	...	1,419,199	...	1,428,223

Table 5 - FUEL AND ELECTRICITY USED FOR METALLURGICAL PURPOSES, 1937 and 1938.

Kind	Unit of measure	1937 Quantity	1937 Cost at works	1938 Quantity	1938 Cost at works
			$		$
Bituminous coal - Canadian	short ton	318,301	1,841,642	239,248	1,417,644
Imported	short ton	33,985	195,403	121,241	696,151
Coke	short ton	265,065	2,715,351	216,469	2,060,410
Gasoline	Imp. gal.	6,606	1,563	5,118	1,039
Kerosene	Imp. gal.	3,015	603	293	59
Fuel oil and diesel oil	Imp. gal.	14,738,353	705,948	12,519,612	606,154
Wood	cord	10,959	53,696	7,910	40,652
Gas - Natural	M cu.ft.	119	96	300	297
Other fuel	$	...	5,076	...	2,327
Electricity purchased	K.W.H.	159,131,601	516,140	130,475,771	422,833
TOTAL	$	...	6,035,518	...	5,247,566

NOTE - In addition to the data shown in Tables 4 and 5 there was consumed in Canada during 1938 approximately $396,000 worth of fuel and electricity, chiefly in the refining of converter copper made from nickel-copper ores.

Table 6 - OUTPUT FROM CANADIAN NICKEL-COPPER MINES AND SMELTERS, 1934 - 1938.

	1934	1935	1936	1937	1938
			(short tons)		
Ore shipped from mines	2,903,310	3,608,437	4,634,434	6,318,907	6,276,232
Ore and concentrates treated (x)	2,896,959	3,616,223	4,620,183	6,304,517	6,280,283
Blister copper produced in Ontario (a)	95,826	119,720	137,369	154,415	147,439
Nickel produced in Ontario(b)	35,487	40,191	51,952	73,650	62,141
Matte exported (c)	46,755	46,371	50,644	58,673	63,423
Nickel content of matte exported	28,771	28,949	32,766	38,663	43,075
Copper content of matte exported	6,692	6,272	6,496	6,497	6,914

(x) Represents the tonnage of crude ore smelted together with the tonnage of ore milled; also in addition to the totals recorded for 1936 and 1937 a relatively small tonnage of nickel-bearing ore was exported from a property located in British Columbia.
(a) Copper content.
(b) Includes nickel content of salts and oxides produced.
(c) Less a relatively small tonnage of matte returned annually to Canada for re-treatment since 1934.

Table 7 - POWER EQUIPMENT INSTALLATION, 1938.

Description	Ordinarily in use		In reserve or idle	
	Number of units	Total horse power	Number of units	Total horse power
Steam engines and steam turbines ...	17	2,161	3	1,134
Hydraulic turbines or water wheels .	...	...	2	720
Electric motors -				
(a) Operated by purchased power ...	2,873	157,187	173	19,199
Total	2,890	159,348	178	21,053
(b) Operated by power generated by the establishment	...	...	...	...
Stationary boilers	17	5,575	1	450

Table 8 - PRODUCTION IN CANADA, IMPORTS AND EXPORTS OF NICKEL, 1937 and 1938.

	1937		1938	
	Pounds	Value $	Pounds	Value $
PRODUCTION -				
Nickel in matte, speiss, residues, etc., exported ..... Refined and electrolytic nickel produced in Canada ... Nickel in oxides and salts sold or produced	224,905,046	59,507,176	210,572,738	53,914,494
IMPORTS -				
Nickel, nickel silver and German silver in ingots or block, n.o.p.	20,061	5,636	24,226	6,603

Table 8 - PRODUCTION IN CANADA, IMPORTS AND EXPORTS OF NICKEL, 1937 and 1938. (concluded)

	1937		1938	
	Pounds	Value $	Pounds	Value $
IMPORTS (concluded) -				
Nickel in bars and rods, strips, sheets and plates	818,946	326,469	830,904	330,131
Nickel silver and German silver in bars, rods, strips, sheets, plates or anodes	97,327	25,785	82,569	22,107
Nickel chromium in bars or rods, etc.	46,246	45,264	43,472	41,805
German, Nevada and nickel silver, manufactures of, not plated ..	...	178,572	...	134,791
Nickel-plated household hollow-ware	...	2,115	...	403
Nickel kitchenware	...	1,344	...	1,105
Nickel-plated ware, n.o.p.	...	887,535	...	864,393
TOTAL - NICKEL AND ITS PRODUCTS	...	1,472,720	...	1,401,338
EXPORTS -				
TOTAL (Metal in all forms)	222,770,000	58,913,217	197,704,000	52,496,417

Table 9 - PRODUCTION OF NICKEL(x) FROM CANADIAN ORES, 1926 - 1938.

Year	Pounds	Value $	Year	Pounds	Value $
1926	65,714,294	14,374,163	1933	83,264,658	20,130,480
1927	66,798,717	15,262,171	1934	128,687,340	32,139,425
1928	96,755,578	22,318,907	1935	138,516,240	35,345,103
1929	110,275,912	27,115,461	1936	169,739,393	43,876,525
1930	103,768,957	24,455,133	1937	224,905,046	59,507,176
1931	65,666,320	15,267,453	1938	210,572,738	53,914,494
1932	30,327,968	7,179,862			

(x) Includes a relatively small quantity of nickel recovered annually from silver-cobalt ores; Canadian nickel production comes entirely from Ontario ores with the exception of 1937 when a relatively small tonnage of nickel ore was exported from a property in British Columbia.

Nickel output from January 1st to June 30th, 1939, totalled 110,465,309 pounds worth $27,748,574 compared with 109,286,472 pounds valued at $28,559,696 during the first six months of 1938. Output consisted of refined nickel made at Port Colborne, nickel in matte exported by the International Nickel Co. of Canada, Limited, and the Falconbridge Nickel Mines, Ltd., and nickel in nickel oxide sold.

Table 10 - PRODUCTION OF COPPER FROM ONTARIO ORES, 1926 - 1938.

Year	Pounds	Value $	Year	Pounds	Value $
1926	41,312,867	4,828,964	1933	145,504,720	10,118,847
1927	45,341,295	4,946,533	1934	205,059,539	14,822,704
1928	66,607,510	8,770,149	1935	252,027,928	19,295,965
1929	88,879,853	14,622,572	1936	287,914,078	26,898,920
1930	127,718,871	15,187,259	1937	322,039,208	41,716,364
1931	112,882,625	9,096,463	1938	309,030,106	30,405,500
1932	77,055,413	4,407,928			

NOTE - Almost entirely from nickel ores. The total production of copper in the entire Dominion in 1938 amounted to 571,249,664 pounds valued at $56,554,034. The production of copper in Canada during the first six months of 1939 totalled 286,242,241 pounds valued at $28,404,985 compared with a corresponding total of 292,396,871 pounds at $27,765,202 in 1938. Of the production during the first half of 1939, Ontario mines contributed 163,677,920 pounds worth $16,131,394 compared with a corresponding output of 163,897,090 pounds at $15,492,188 in 1938.

Table 11 - PRODUCTION OF METALS OF THE PLATINUM GROUP FROM ONTARIO COPPER-NICKEL ORES, 1927 - 1938.

Year	PLATINUM(a)		PALLADIUM(/)	
	Fine ounces	$	Fine ounces	$
1927	11,217	716,653	11,545	554,190
1928	10,483	706,090	13,607	627,833
1929	12,491	845,057	17,318	809,289
1930	34,007	1,542,490	34,092	896,867
1931	44,725	1,595,117	46,918	1,217,717
1932	27,284	1,097,021	37,613	901,890
1933	24,746	856,190	31,009	645,043
1934	116,177	4,488,712	83,932	1,699,228
1935	105,335	3,444,455	84,772	1,962,937
1936	131,551	5,319,922	103,671	2,483,075
1937	139,355	6,751,750	119,829	3,179,782
1938	161,310	5,196,279	130,893	3,677,342

(a) A relatively small quantity of alluvial platinum is recovered annually in British Columbia; such recovery in 1938 totalled 16 ounces valued at $515.
(/) Includes other platinum metals except platinum.

Table 12 - WORLD PRODUCTION OF NICKEL ORE, 1934 - 1938.(/)
(In terms of metal)

Country	1934	1935	1936	1937	1938
			(Short tons)		
Canada (a)	64,344	69,258	84,870	112,453	105,337
New Caledonia (b)	5,500	5,800	5,400	6,600	7,500
Greece (d)	1,200	1,200	1,380	1,160	(x)
Burma (c)	1,354	1,640	1,447	1,345	1,030
Norway	1,532	1,677	1,400	968	(x)
Russia	951	2,016	(x)	(x)	(x)

For footnotes - see next page.

Footnotes to Table 12 -

NOTE - This statement supplied by the American Bureau of Metal Statistics.
(/) - Production outside of these countries is very small.
(a) - Production in all forms from Canadian ores.
(b) - Estimated content of ore and matte exported.
(c) - Nickel content of speiss obtained as a by-product.
(d) - Nickel and cobalt content beginning 1934.
(x) - Not yet reported.

The nickel refining capacity of the International Nickel Co. of Canada, Limited, at the end of 1938 was 42,000,000 pounds per annum at Clydach, Wales, and 148,000,000 pounds (electrolytic nickel) at Port Colborne, Ontario. In addition, the Company has a capacity to produce 35,000,000 pounds of nickel in the form of oxide, alloys, salts and other forms.

Of world nickel consumption in 1938, it is estimated that the following proportions were used by the principal nickel consuming industries: steel mills and steel foundries, 60%; iron and brass foundries, 5%; brass and copper mills, 14%; alloy manufacturers (including the company's own plants producing malleable nickel, monel and other nickel alloys), 13%; and electroplaters and chemical manufacturers, 8%. During the last 13 years the base spot price for nickel in the United States has been 35 cents per pound.

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DIRECTORY

FIRMS IN THE NICKEL-COPPER MINING AND SMELTING INDUSTRY IN CANADA, 1938.

NOTE - (x) Active but not producing.

Name of Firm	Head Office Address	Location of Canadian plant
ONTARIO -		
(x) Anglo-Sudbury Nickel Corp. Ltd.	706 Concourse Bldg., Toronto	Levack, Trill, Wisner, Bowell, and Norman Tps.
(x) Denison Nickel Mines Ltd.	607 Reford Bldg., 217 Bay St., Toronto	Worthington
(x) Drury Nickel Mines Ltd.	Room 1701 - 372 Bay St., Toronto	Drury Tp.
Falconbridge Nickel Mines, Ltd.	25 King St. W., Toronto	Falconbridge Tp.
International Nickel Co. of Canada, Limited	Copper Cliff	Mines - Tps. of Levack, Snider, McKim and Garson. Smelters - Copper Cliff and Coniston. Nickel refinery - Port Colborne.
(/) Operated by a subsidiary company - The Ontario Refining Co. Ltd.		(/)Copper refinery - Copper Cliff.

D I R E C T O R Y (concluded)

FIRMS IN THE NICKEL-COPPER MINING AND SMELTING INDUSTRY IN CANADA, 1938 (concluded)

NOTE (x) Active but not producing.

Name of Firm	Head Office Address	Location of Canadian Plant
ONTARIO (concluded) -		
(x) Nickel Offsets Ltd.	Room 1701 - 372 Bay St., Toronto	Foy, Bowell and Morgan Tps.
(x) Ontario Nickel Corp. Ltd.	38 King St. W., Toronto	Strathy Tp. and Sudbury Dist.
BRITISH COLUMBIA -		
(x) Pacific Nickel Mines Ltd.	Choate	Yale M.D.
(x) Western Nickel Corp. Ltd.	2 ... 425 Howe St., Vancouver	Yale M.D.

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