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CANADA

DEPARTMENT OF TRADE AND COMMERCE

DOMINION BUREAU OF STATISTICS

CENSUS OF INDUSTRY

MINING, METALLURGICAL & CHEMICAL BRANCH

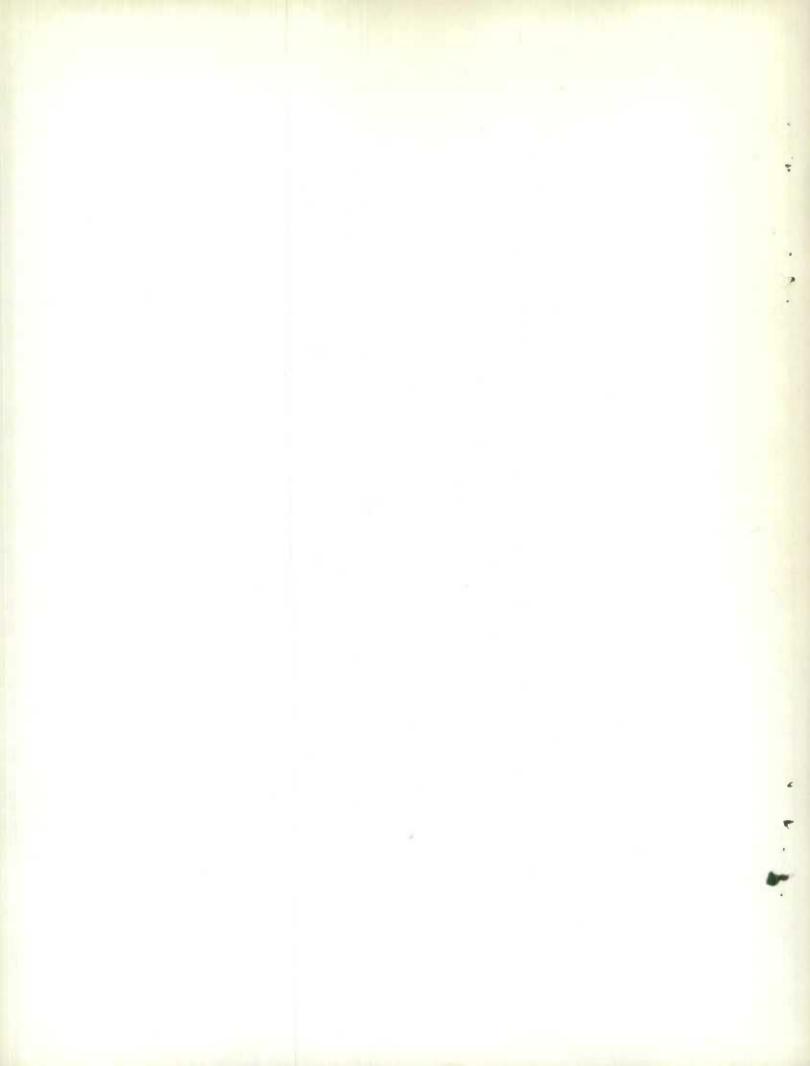
THE

AND NICKEL REFINING INDUSTRY
IN
CANADA

1938



OTTAWA 1939



DEPARTMENT OF TRADE AND COMMERCE
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CENSUS OF INDUSTRY
MINING, METALLURGICAL AND CHEMICAL BRANCH
OTTAWA - CANADA

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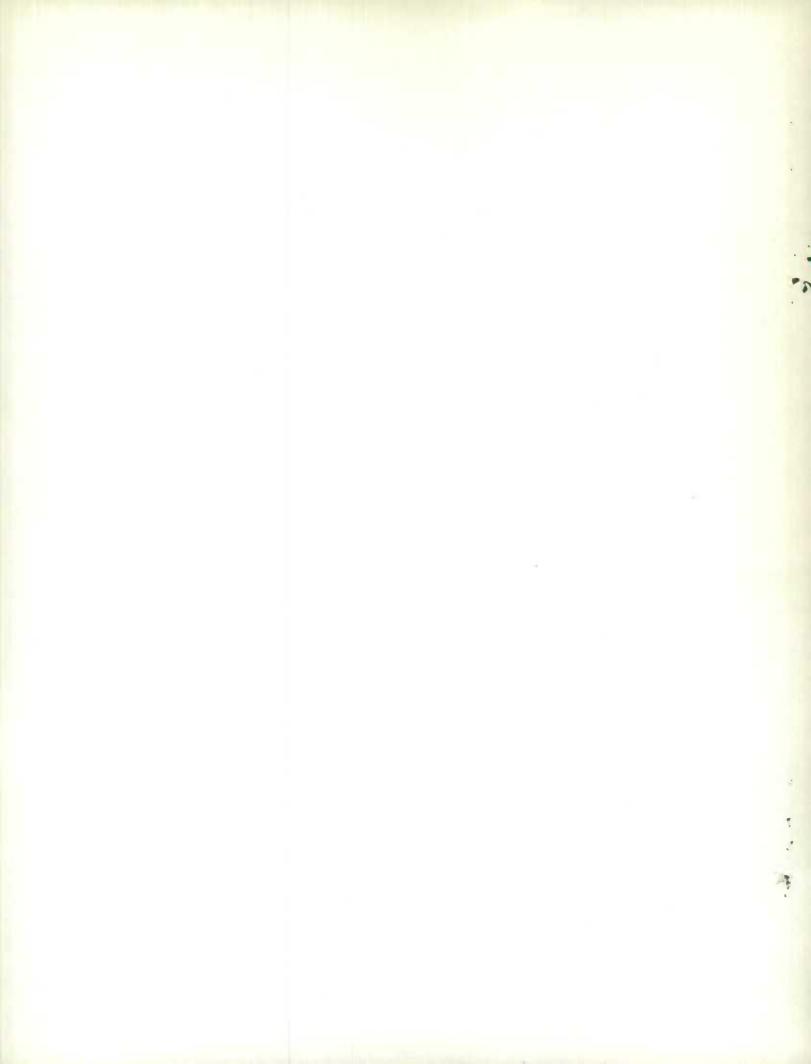
THE NICKEL-COPPER MINING, NICKEL-COPPER SMELTING and NICKEL REFINING INDUSTRY
IN CANADA, 1938.

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 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 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 nickelcopper 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..

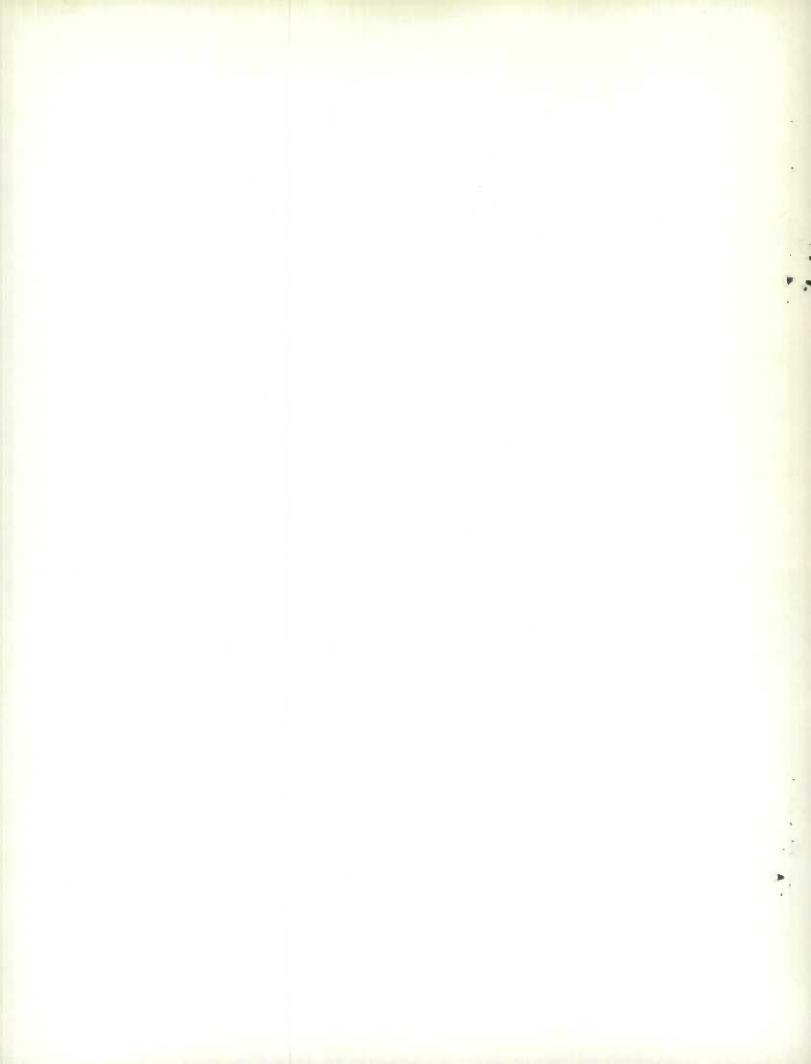


Table 1 - PRINCIPAL STATISTICS OF THE NICKEL-COPPER MINING, SMELTING AND REFINING
INDUSTRY IN CANADA, 1936 - 1938. (x)

		1936	1937	1938	}
Number of firms		5 9 4 1	(a)9 12 3 1	1	3
Capital employed		293 8,469	104,313,953 323 10,435 10,758	111,947,69 32 10,07	75
Salaries and wages Salaries	***	922,545 12,737,427 13,659,972	1,075,552 17,677,175 18,752,727	1,114,51 17,122,88 18,237,39	33
Fuel and purchased electricity used (c) Process supplies used (b) Estimated gross value of matte exported and	\$	5,679,676 8,669,422	7,454,717 11,210,353	6,675,78	72
Value of production less items (b) and (c)		63,244,633	111,353,066 92,687,996	96,309,23 78,854,77	

⁽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
	7.034	4.033	0.000	0.700	30 540
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

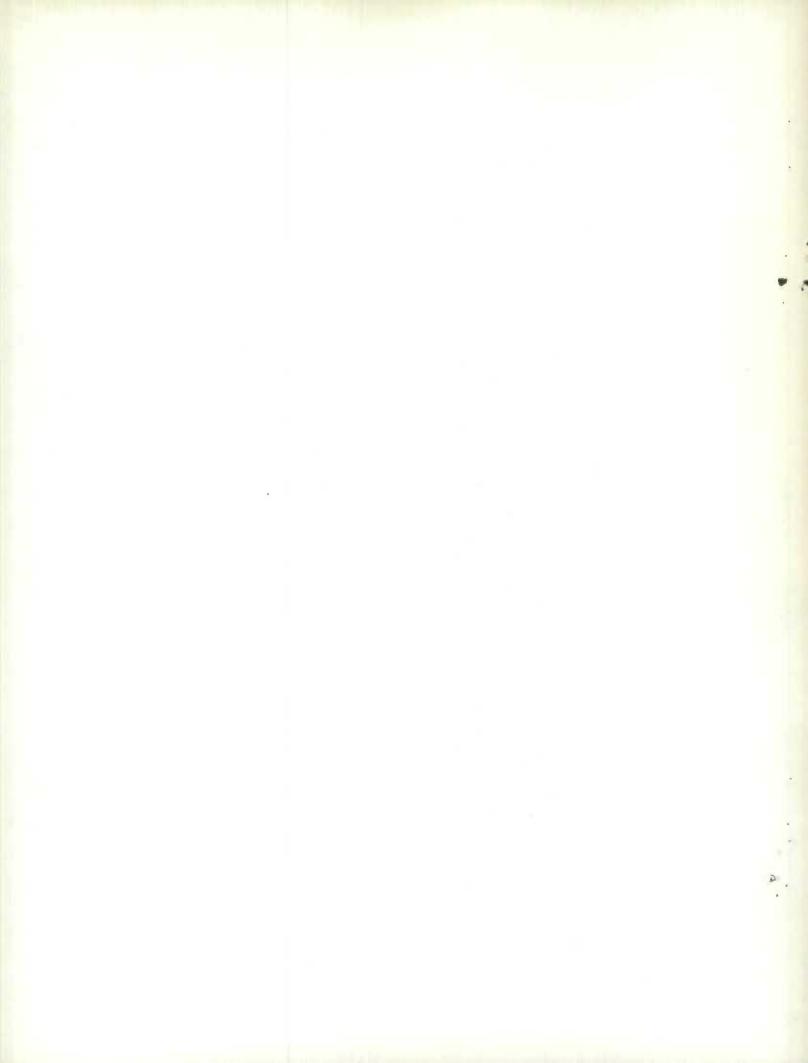


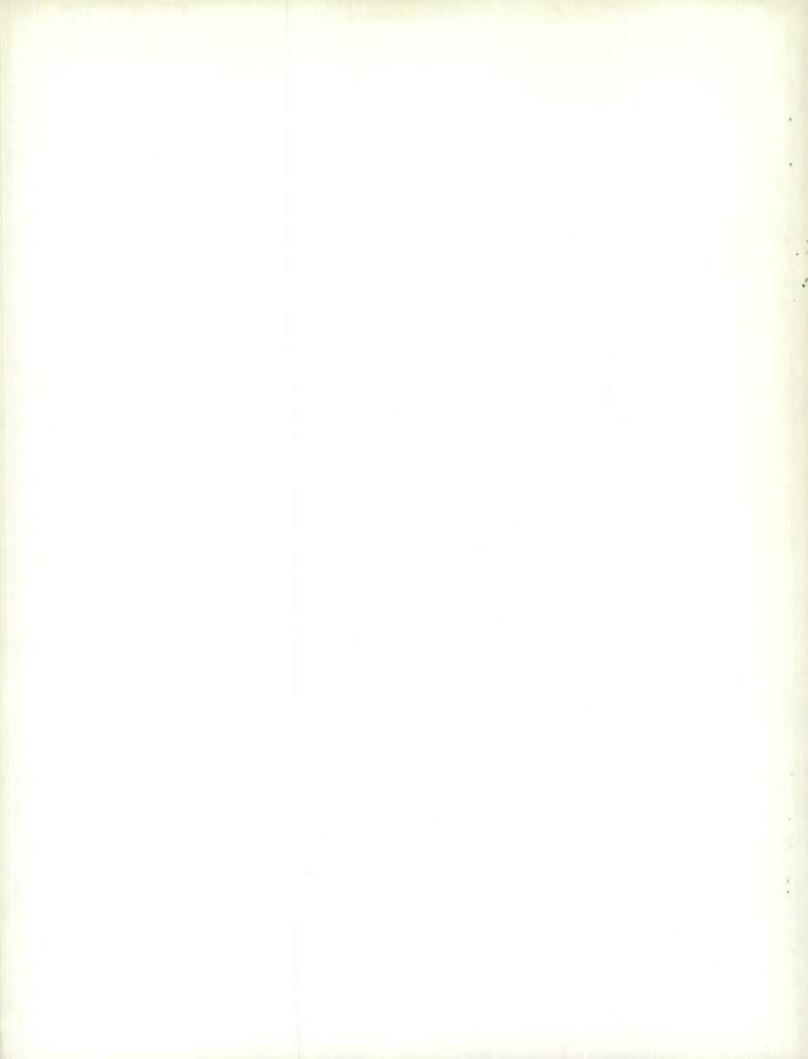
Table 3 - NUMBER OF WAGE-EARNERS WHO WORKED THE NUMBER OF HOURS SPECIFIED, DURING ONE WEEK IN MONTH OF NORMAL EMPLOYMENT, 1938.

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

Table 4 - FUEL AND ELECTRICIT	Y USED FOR	LIGHT AND PO	OWER, 1937	and 1938.	
		1 9 3	7	1 9 3	8
Kind	Unit of		Cost at		Cost at
	measure	Quantity	works	Quantity	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		56,503	12,471	51,840	11,121
Kerosene		4,852	986	8,790	1,744
Fuel oil and diesel oil		289,654	29,522	337,888	33,876
Wood	-	321		20	80
Electricity purchased				353,514,218	1,244,598
TOTAL			1,419,199		1,428,223

Table 5 - FUEL AND ELECTRICIT	Y USED FOR	METALLURGIC	AL PURPOSES	, 1937 and	1938.
		1 9	3 7	1 9	3 8
Kind	Unit of		Cost at		Cost at
	measure	Quanti ty	works	Quantity	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		119	96	300	297
Other fuel	\$	4 * *	5,076		2,327
Electricity purchased	K.W.H.	159,131,601	516,140	130,475,771	422,833
TOTAL					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.



	1934	1935	1936	1937	1938
		(sb	ort tons)		
Ore shipped from mines Ore and concentrates	2,903,310	3,608,437	4,634,434	6,318,907	6,276,232
treated (x)	2,896,959	3,616,223	4,620,183	6,304,517	6,280,283
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
Natte exported (c) Nickel content of matte	46,755	46,371	50,644	158,673	63,423
exported	28,771	28,949	32,766	38,663	43,075
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 retreatment since 1934.

Table 7 - POWER EQUIPMENT INSTALLATION, 1938.

German silver in ingots or

block, n.o.p.

	Ordinaril	y in use	In reserve or idle	
Description	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 . Electric motors -	• • •	• • •	2	720
(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	a			
Stationary boilers	17	5,575	1	450

Stationary boilers	. 17	5,575	1	450
Table 8 - PRODUCTION IN CANADA, IMPO	ORTS AND EXP	ORTS OF NICK	EL, 1937 and 1	.938.
		3 . 7	1	9 3 8
	Pounds	Value	Pounds	Value
		\$		\$
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 silver and				

20,061

5,636

24,226

6,603

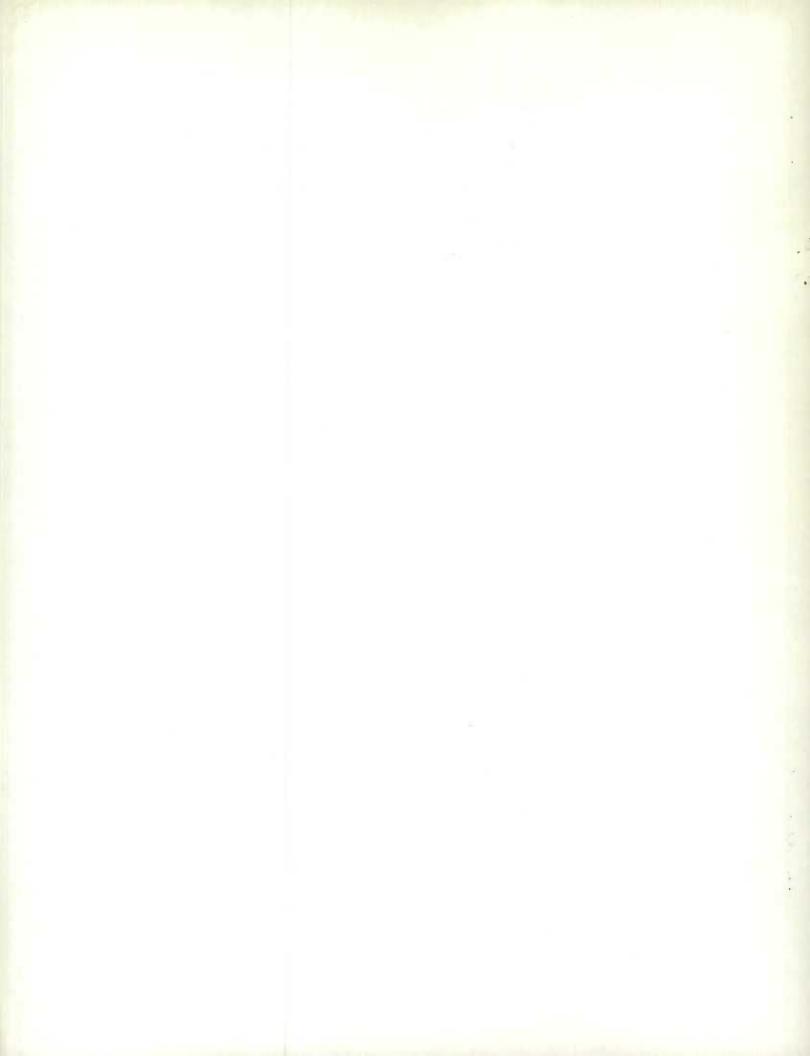


Table 8 - PRODUCTION IN CANADA, IMPORTS AND EXPORTS OF NICKEL, 1937 and 1938.

(concluded)					
1 9	3 7	1 9	3 8		
Pounds	Value	Pounds	Value		
	\$		\$		
818,946	326.469	830,904	330,131		
, , , , , , , , , , , , , , , , , , , ,					
97.327	25,785	82,569	22,107		
, a		0.0,000	13.19		
46 246	45 264	43 479	41,805		
40,040	10,001	40,216	41,000		
	170 579		134,791		
* * *	110,012	• • •	134,131		
	0 335		407		
* * *			403		
290	1,344		1,105		
000	887,535		864,393		
	1.472.720		1,401,338		
	1 9 Pounds 818,946 97,327 46,246	1 9 3 7 Pounds Value \$ 818,946 326,469 97,327 25,785 46,246 45,264 178,572 2,115 1,344 887,535	1 9 3 7 1 9 Pounds Value Pounds \$ 818,946 326,469 830,904 97,327 25,785 82,569 46,246 45,264 43,472 178,572 2,115 1,344 887,535		

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 \$
1927 1928 1929 1930 1931	65,714,294 66,798,717 96,755,578 110,275,912 103,768,957 65,666,320 30,327,968	14,374,163 15,262,171 22,318,907 27,115,461 24,455,133 15,267,453 7,179,862	1937	83,264,658 128,687,340 138,516,240 169,739,393 224,905,046 210,572,738	20,130,489 32,139,425 35,345,103 43,876,525 59,507,176 53,914,494

⁽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.

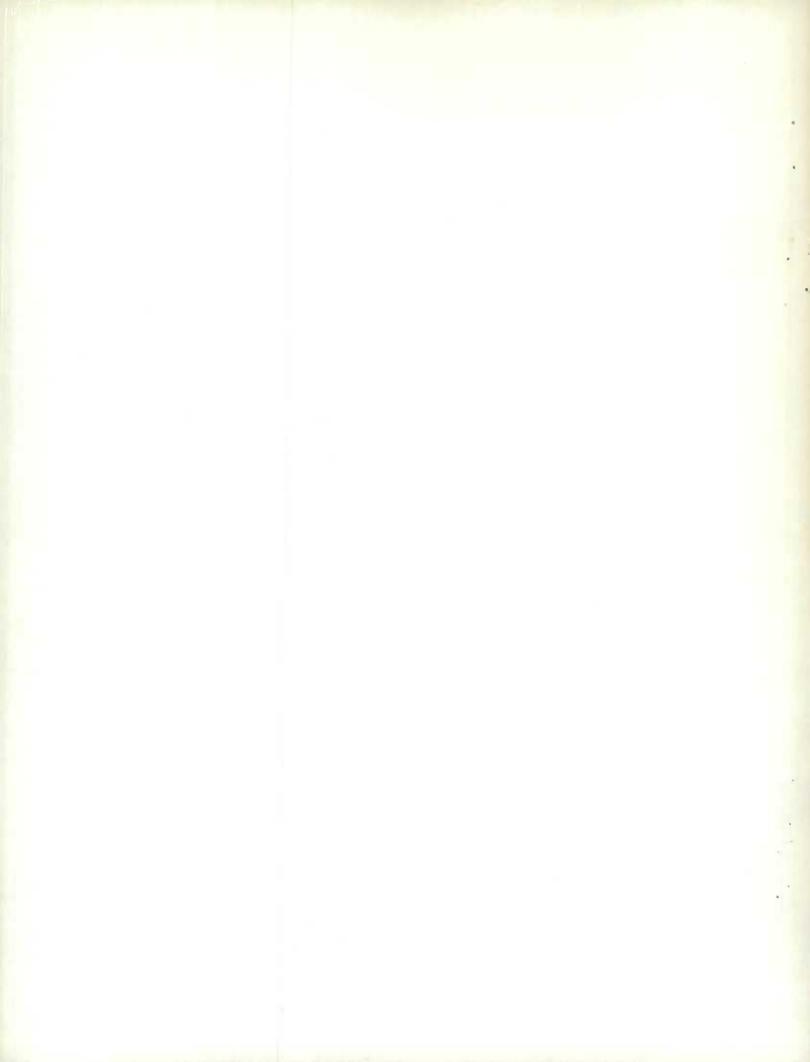


Table 10 - PRODUCTION OF COPPER FROM ONTARIO ORES, 1926 - 1938.

Year	Pounds	Value \$	Year	Pounds	Value 3
1926 1927 1928 1929 1930 1931	41,312,867 45,341,295 66,607,510 .88,879,853 127,718,871 112,882,625 77,055,413	4,828,964 4,946,533 8,770,149 14,622,572 15,187,259 9,096,463 4,407,928	1933 1934 1935 1936 1937	145,504,720 205,059,539 252,027,928 287,914,078 322,039,208 309,030,106	10,118,847 14,822,704 19,295,965 26,898,920 41,716,364 30,405,500

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,

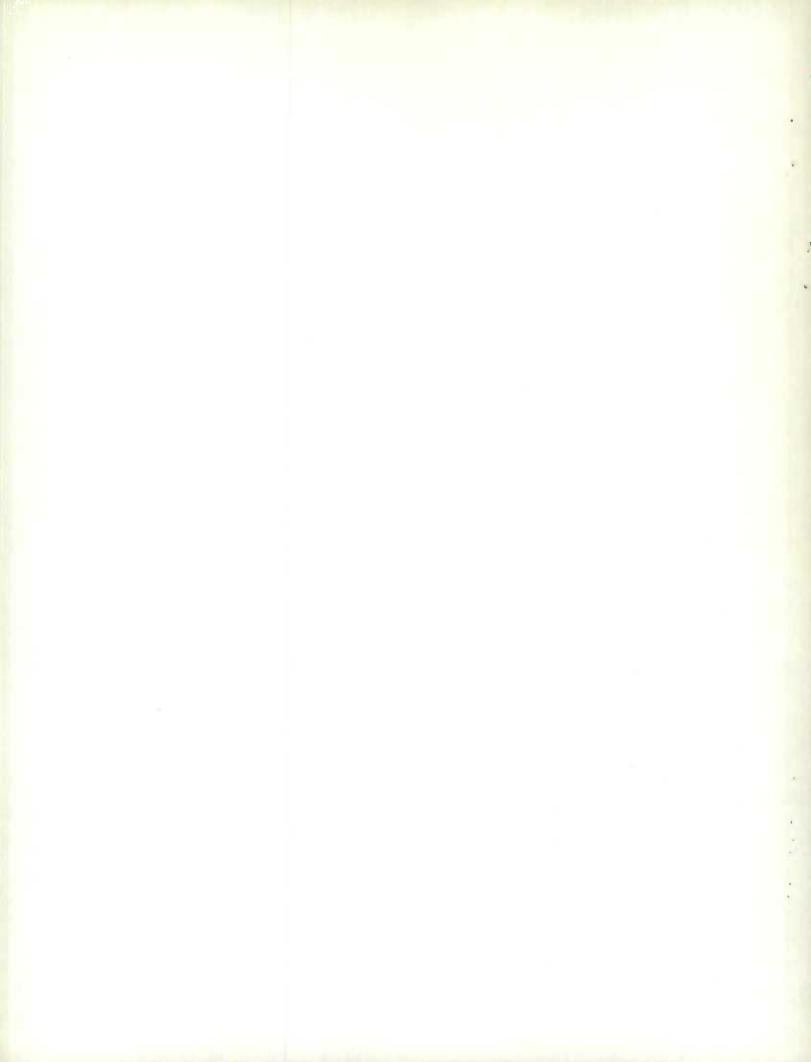
37	PLATINUM	(a)	PALLADIUM(/)		
Year	Fine ounces	\$	Fine ounces	\$	
1927	11,217	716,653	11,545	554,190	
1928	10,483	706,090	13,607	627,833	
1929	12,491	845,057	17,318	809,289	
1930	34,007	1,542,490	34,092	896,867	
1931	44,725	1,595,117	46,918	1,217,717	
1932	27,284	1,097,021	37,613	901,890	
1933	24,746	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 metal's except platinum.

Table 12 - WORLD PRODUCTION OF NICKEL ORE, 1934 - 1938. (/)

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



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.

DIRECTORY

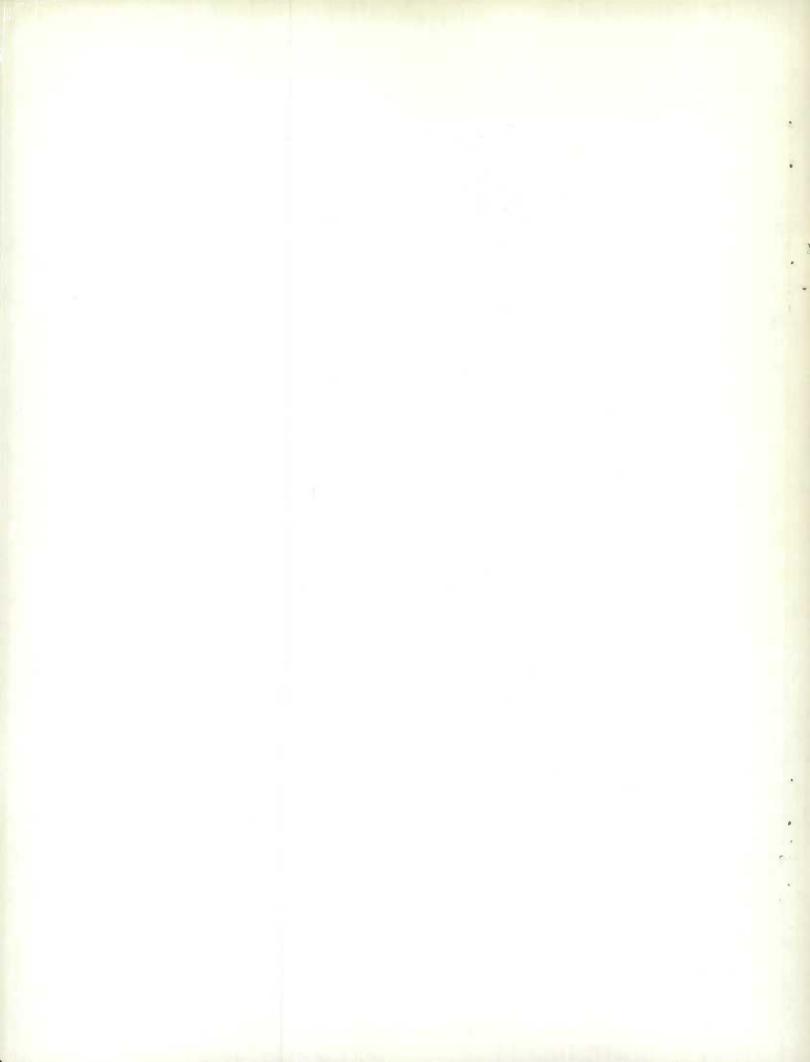
FIRMS IN THE NICKEL-COPPER MINING AND SMELTING INDUSTRY IN CANADA, 1938.

FIRMS IN THE NICKEL-COPPER D	MINING AND SMELLING INDUSTRI IN	MINKUK, 1300.
NOTE - (x) Active but not producing.		Location of
Name of Firm	Head Office Address	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	Druy 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.

(/) Operated by a subsidiary company - The Ontario Refining Co.
Ltd.

Port Colborne.
(/)Copper refinery Copper Cliff.

Smelters -Copper Cliff and Coniston. Nickel refinery -



DIRECTORY (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	
w ·		*	
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.	
ERITISH 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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