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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 REFINING INDUSTRY

IN

CANADA

1937

OTTAWA
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Price 25 cents

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THE NICKEL-COPPER MINING, SMELTING AND REFINING INDUSTRY IN CANADA, 1937.

Production of new nickel in Canada from all sources and in all forms totalled 224,905,046 pounds valued at $59,507,176 during 1937. This was an increase over 1936 in output and value of 32.5 and 35.6 per cent respectively, and represents a new all time high record in the production of nickel in Canada. Practically the entire production of Canadian nickel comes from ores mined in the Sudbury district of Ontario. The nickel bearing deposits of the Sudbury area also contain relatively high values in copper and the platinum metals and the recoveries of these metals in 1937 were also the greatest ever realized in the history of the Canadian nickel-copper mining industry. The output of copper in Ontario in 1937 was estimated at 322,039,208 pounds, valued at $41,716,364 while the combined values of platinum metals recovered during the same period from nickel-copper ores totalled $9,931,532. Copper recovered from Ontario nickeliferous ores, in 1937, comprised approximately 61 per cent of the total Canadian copper output for the year, while the value of the platinum metals produced in the same period exceeded the combined values of all metals produced in the Yukon, Northwest Territories and Nova Scotia in 1937 and was greater than the total value of all metals produced in the entire Province of Ontario in 1899.

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 products of the Canadian industry, considered as a whole, was estimated at $111,353,066 in 1937 compared with a corresponding value of $77,593,731 in the preceding year. It is also interesting to note that silver recovered from the Sudbury nickel-copper ores totalled 2,364,010 fine ounces in 1937, a recovery that was some 548,961 ounces in excess of the total silver produced in 1937 from silver-cobalt ores mined in the noted Cobalt and Gowganda camps; silver recovered from nickel-copper ores during 1937 amounted to 10.3 per cent of the total silver produced by the entire Canadian mining industry. Gold recovered from Canadian nickel-copper ores totalled 75,438 fine ounces in 1937. 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 Company 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 Company is treated in plants located at Clydach, Wales; Huntington, West Virginia, and at Port Colborne and Copper Cliff, Ontario. In British Columbia a relatively small tonnage of crude nickel ore was mined and exported

during 1937 by the B. C. Nickel Mines, Ltd.

The number of firms reported as actually engaged in the production of nickel or in the exploration or development of nickel bearing deposits in Canada totalled 9 during 1937 as compared with 5 in 1936. Of the 1937 operations 6 were located in Ontario, 2 in British Columbia and 1 in New Brunswick. Smelting and refining operations were confined to the Province of Ontario. Capital employed in 1937 by the industry, as a whole, amounted to $104,313,953; employees numbered 10,758; salaries and wages distributed totalled $18,752,727 and the net value of all products of the industry was estimated at $92,687,996 as against a corresponding value of $63,244,633 in 1936.

The International Nickel Company of Canada Ltd., reported that, in 1937, ore requirements totalled 5,880,278 short tons of which 3,804,409 tons were extracted from the Frood mine, 1,283,046 tons from the Creighton, 399,076 tons from the Levack and 393,747 tons from the Garson. The Levack mine was re-opened in March and a new shaft at the property was being sunk to a depth of 2,000 feet; this shaft, together with a new surface plant and mine equipment is expected to be ready for operation in 1939 for an output up to 4,000 tons per day.

As a result of a comprehensive survey it was decided by the International Nickel Co. to adopt open pit mining for the upper portion of the Frood ore body and it is intended that 4,000 tons of ore per day will be available from this operation during the early months of 1939. The combination of surface mining and mining at depth will assume, it is stated, an average grade of ore over the future life of this mine. In all the mines ordinary development in 1937 was continued by the company at a rate conforming with production requirements. The total footage advance was 60,639 feet, thus bringing the total underground workings in the four operating mines to 673,120 feet or approximately 127 miles.

The concentrator of the International Nickel Company operated at capacity in 1937 and treated 4,583,100 tons of ore at a rate slightly in excess of 12,500 tons per day. The Copper Cliff smelter produced 186,169 tons of bessemer matte and 158,100 tons of converter copper. The Coniston smelter was operated at full capacity and ore to the amount of 891,956 tons was treated and 54,329 tons of bessemer matte produced. At the Port Colborne, Ontario, refinery 147,264,099 pounds of refined nickel was produced in 1937. The electrolytic copper refinery of the Ontario Refining Co. Ltd., located at Copper Cliff, processed 159,286 tons of converter copper made at the Copper Cliff smelter and produced 145,609 tons of refined copper.

In Wales at the Clydach nickel refinery (The Mond Nickel Co. Ltd.) the output of pellet nickel was 39,554,965 pounds, in addition to which 11,755,800 pounds of salts were produced, containing 2,430,130 pounds of nickel; with completion of improvements this refinery is expected to reach a production rate of 50,000,000 pounds per annum. Due to increased output of nickel at Port Colborne and Clydach the production of by-product platinum metals at the Acton (England) platinum metals refinery was 255,165 ounces, comparable with 232,343 ounces in 1936.

The total number of employees at the end of 1937 was 17,434, distributed as follows: Canada, 11,486; Great Britain, 3,421; United States, 2,472; other countries, 55. During the year the Company provided for contributory non-occupational accident and sickness insurance benefits for all its employees in Canada and the United States, whose remuneration is on an hourly basis.

Proven ore reserves at December 31, 1937, were reported by the International Nickel Company of Canada, Ltd., at 206,397,000 short tons. While the total

ore reserves show an increase of 3,777,000 tons over the figures first reported in 1930 the net result is that, due to the inclusion of lower grade ores, the total ore reserves now contain 6,739,000 tons of copper nickel, comparable with 6,927,000 tons of copper nickel in the reserves as at December 31, 1929.

Falconbridge Nickel Mines Ltd., reported that all units of the plant, as completed in the expansion programme of 1936 were in continuous operation throughout 1937, with the expected increase in production being fully realized.

Of a total of 5,141 feet of drifting and cross-cutting, 3,518 feet were along the ore zone on different levels, the greater part of this footage being acounted for on the 1,200 and 1,750 levels at No. 5 shaft. No. I shaft was deepened 915 feet from the sump below the 1,200 level to a total depth of 2,126 feet; at the end of the year preparations were under way to resume sinking at No. 5 shaft early in 1938. From the total ore hoisted some 12,243 tons of waste was picked and discarded; of the 438,629 tons of ore treated in 1937, 195,658 tons was milling ore and 242,971 smelting ore. Matte produced totalled 13,384.2 short tons containing 7,384.4 short tons of nickel and 3,522.8 short tons of copper. The company's refinery in Norway operated steadily and normally throughout the year with the exception of a five week's close down due to a strike, and the disorganization due to same; custom nickel matte containing 895.76 metric tons of nickel was received at this plant in 1937.

In addition to the new areas in the Falconbridge mine itself the company was able to bring into the ore reserves for the first time, tonnages from their holdings in other sections of the Sudbury district. Total ore reserves as of December 31, 1937 were reported at 6,332,601 tons averaging 1.82% nickel and 0.89% copper.

Drury Nickel Mines Ltd., formerly the Van Nickel Mines Ltd., reported early in 1938 that some 2,000 feet of diamond drilling was being conducted on its property located near Worthington in Drury township of the Sudbury district.

Diamond drilling in 1937 was also reported by the Anglo-Sudbury Nickel Corp. Ltd. This company holds mining properties in the townships of Wisner, Norman, Trill, Levack and Bowell -- districts of Algoma and Sudbury. The Ontario Nickel Corp. Ltd. did not operate its smelter in 1937 and only minor surface operations were conducted on its properties; these were limited to the first six months of the year. Development operations on a nickel-copper deposit in Denison township were also reported as being conducted in 1937 by Denison Nickel Mines Ltd.

In New Brunswick, diamond drilling operations were conducted in 1937 on a nickel-copper deposit located near St. Stephen. This property is owned by the Maruba Corp. Ltd.

In British Columbia mining operations under contract were conducted during October and November, 1937, by the Western Nickel Corp. Ltd. on a nickel deposit located near Yale.

According to the British Columbia Department of Mines the development work conducted during the first six months of 1937 by the B. C. Nickel Mines Ltd. at its property near Choate, consisted of raising 177 feet, cross-cutting 83 feet, drifting 17 feet, and station-cutting 2,000 feet. All cross-cutting and drift-work served to open up a known ore-body -- the Pride of Emory. During May and June about 3,500 tons of average-grade ore was produced to supply prospective nickel-concentrate buyers with a sample of the product. During the remainder of the year all underground work was discontinued and a skeleton crew maintained to keep the buildings, plant and road in condition until such time as a decision is come to for the erection of a mill.

The Bureau of Mines, Ottawa, stated in a report that important new activities in Ontario during 1937 included the incorporation of Kenora Nickel Mines Ltd., as a subsidiary of Coniagas Mines Limited, to develop the latter's nickel property at Empire Lake in the Kenora District; and the purchase, after diamond drilling, of the Cross nickel property at Shebandowan Lake, west of Port Arthur, by the International Nickel Company of Canada Ltd.

Table 1 - PRINCIPAL STATISTICS OF THE NICKEL-COPPER MINING, SMELTING AND REFINING INDUSTRY IN CANADA, 1935-1937.(x)

	1935	1936	1937
Number of firms	4	5	9(a)
Number of mines	7	9	12
Number of smelters	3	4	3
Number of refineries	1	1	1
Capital employed	$ 87,015,617	97,838,133	104,313,953
Number of employees - On salary	245	293	323
On wages	6,764	8,469	10,435
Total	7,009	8,762	10,758
Salaries and wages - Salaries	$ 800,700	922,545	1,075,552
Wages	$ 10,474,950	12,737,427	17,677,175
Total	$ 11,275,650	13,659,972	18,752,727
Fuel and purchased electricity used (c)	$ 4,735,768	5,679,676	7,454,717
Process supplies used (b)	$ 7,181,698	8,669,422	11,210,353
Estimated gross value of matte exported and Canadian refinery products	$ 58,996,451	77,593,731	111,353,066
Value of production less items (b) and (c)	$ 47,078,985	63,244,633	92,687,996

(x) Does not include data for copper refineries.
(a) 6 firms in Ontario, 2 in British Columbia and 1 in New Brunswick.

Table 2 - NUMBER OF WAGE-EARNERS EMPLOYED, BY MONTHS, 1931 - 1937.

Month	1931	1932	1933	1934	1935	1936	1937
January	4,726	3,014	1,822	4,811	5,666	8,076	9,302
February	4,656	3,019	1,957	4,876	5,804	8,044	9,572
March	4,641	3,039	2,036	5,048	6,077	8,103	9,840
April	4,620	2,577	1,976	5,189	6,277	8,191	10,118
May	4,597	2,379	2,034	5,409	6,446	8,257	10,458
June	4,422	2,454	3,001	5,622	6,573	8,411	10,762
July	4,324	2,235	3,957	5,658	6,733	8,653	11,009
August	4,262	1,672	4,523	5,566	7,253	8,804	11,036
September	3,657	1,628	4,775	5,500	7,500	8,606	11,048
October	3,068	1,580	5,050	5,722	7,714	8,700	10,760
November	3,195	1,490	4,968	5,707	7,632	8,735	10 695
December	3,094	1,551	4,762	5,609	7,489	9,050	10,578

Table 3 - NUMBER OF WAGE-EARNERS IN MONTH OF HIGHEST EMPLOYMENT DURING 1936 AND 1937 WITH REGULAR HOURS WORKED PER WEEK.

Hours per week	Number		Hours per week	Number	
	1936	1937		1936	1937
40 or less	6	3	51 - 53	3	...
41 - 43	1	...	54	178	5
44	159	170	55	3	...
45 - 47	913	1,023	56 - 59	626	440
48	7,362	9,652	60	43	133
49 - 50	3	1	60 plus	44	5

Table 4 - FUEL AND ELECTRICITY USED FOR LIGHT AND POWER, 1936 AND 1937.

Kind	Unit of Measure	1936 Quantity	1936 Cost at works	1937 Quantity	1937 Cost at works
			$		$
Bituminous coal - Canadian ..	short ton	4,512	25,435	4,140	24,648
Imported ..	" "	14,591	87,826	14,077	86,951
Anthracite coal - United States	" "	4	74	124	1,394
Other	" "	129	1,812	128	2,005
Coke	" "	957	10,701	253	2,553
Gasoline	Imp. gal.	(x)40,824	8,721	56,503	12,471
Kerosene	" "	3,480	721	4,852	986
Fuel oil and diesel oil	" "	191,933	19,104	289,654	29,522
Wood	cord	3,415	10,976	321	1,315
Gas - Natural	M cu.ft.	370	260	...	...
Other fuel	xxx	...	882	...	...
Electricity purchased	K.W.H.	358,962,015	918,962	464,328,559	1,257,354
TOTAL	xxx		... 1,085,470		... 1,419,199

(x) Exclusive of that used in motor vehicles.

Table 5 - FUEL AND ELECTRICITY USED FOR METALLURGICAL PURPOSES, 1936 AND 1937.

Kind	Unit of	1936 Quantity	1936 Cost at works	1937 Quantity	1937 Cost at works
			$		$
Bituminous coal - Canadian ..	short ton	233,479	1,331,448	318,301	1,841,642
Imported ..	" "	37,255	310,549	33,985	195,403
Anthracite coal	" "	...	...	...	...
Coke	" "	204,984	2,052,769	265,065	2,715,351
Gasoline	Imp. gal.	(x)2,358	680	6,606	1,563
Kerosene	" "	4,371	870	3,015	603
Fuel oil and diesel oil	" "	10,749,876	500,710	14,738,353	705,948
Wood	cord	6,631	56,565	10,959	53,696
Gas - natural	M cu.ft.	...	...	119	96
Other fuel	xxx	...	7,882	...	5,076
Electricity purchased	K.W.H.	115,218,696	432,733	159,131,601	516,140
TOTAL	xxx		... 4,594,206		... 6,035,518

(x) Exclusive of that used in motor vehicles.

Table 6 - OUTPUT FROM CANADIAN NICKEL-COPPER MINES AND SMELTERS, 1933 - 1937.
(short tons)

	1933	1934	1935	1936	1937
Ore shipped from mines	1,533,887	2,903,310	3,608,437	4,634,434	6,318,907
Ore and concentrates treated (x)	1,523,814	2,896,959	3,616,223	4,620,183	6,304,517
Blister copper produced in Ontario (a)	60,398	95,826	119,720	137,369	154,415
Nickel produced in Ontario (b)	20,748	35,487	40,191	51,952	73,650
Matte exported (c)	43,315	46,755	46,371	50,644	58,673
Nickel content of matte exported	25,811	28,771	28,949	32,766	38,663
Copper content of matte exported	12,323	6,692	6,272	6,496	6,497

(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: 1937.

Description	Ordinarily in use		In reserve or idle	
	Number of units	Total h.p.	Number of units	Total h.p.
Steam engines and steam turbines .	20	2,251	3	1,134
Diesel engines	1	153	...	...
Gasoline, gas and oil engines, other than diesel engines	1	1	...	...
Hydraulic turbines or water wheels	2	720	...	...
Electric motors:- (a) Operated by purchased power.	2,534	144,750	102	9,135
TOTAL	2,558	147,875	105	10,269
(b) Operated by power generated by the establishment	2	9	...	...
Stationary boilers	19	5,823	1	450

Table 8 - PRODUCTION IN CANADA, IMPORTS AND EXPORTS OF NICKEL, 1936 AND 1937.

	1936		1937	
	Quantity	Value	Quantity	Value
	Lb.	$	Lb.	$
Production -				
Nickel in matte, speiss, residues, etc. exported ..... Refined and electrolytic nickel produced in Canada ... Nickel in oxides and salts sold or produced	163,739,393	43,876,525	224,905,046	59,507,176
Imports -				
Nickel, nickel silver and German silver in ingots or block, n.o.p.	10,008	2,603	20,061	5,636
Nickel in bars and rods, strips, sheets and plates ...	769,061	300,141	818,946	326,469
Nickel silver and German silver in bars, rods, strips, sheets, plates or anodes	101,585	27,920	97,327	25,785
Nickel chromium in bars or rods, etc.	52,825	51,170	46,246	45,264
German, Nevada and nickel silver, manufactures of, not plated	...	126,081	...	178,572
Nickel-plated household hollow-ware	...	2,212	...	2,115
Nickel kitchenware	...	1,473	...	1,344
Nickel-plated ware, n.o.p. ...	...	665,649	...	887,535
TOTAL nickel and its products	...	1,777,249	...	1,472,720
Exports -				
TOTAL (metal in all forms).	173,637,500	44,594,296	222,770,000	58,913,217

Table 9 - PRODUCTION OF NICKEL(x) FROM CANADIAN ORES, 1926 - 1937.

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

(x) Includes a relatively small quantity of nickel recovered annually from silver-cobalt ores; Canadian nickel production comes almost entirely from Ontario ores.

Nickel output from January 1 - June 30, 1938, totalled 109,286,472 pounds worth $28,559,696 compared with 111,610,392 pounds valued at $29,218,283 during the first six months of 1937. Output consisted of refined nickel made at Port Colborne, nickel in matte exported by the International Nickel Company of Canada, Limited, and the Falconbridge Nickel Mines Ltd., and nickel in nickel oxide sold.

Table 10 - PRODUCTION OF COPPER FROM ONTARIO ORES, 1926 - 1937.

Year	Pounds	Value $	Year	Pounds	Value $
1926	41,312,867	4,828,964	1932	77,055,413	4,407,928
1927	45,341,295	4,946,533	1933	145,504,720	10,118,847
1928	66,607,510	8,770,143	1934	205,059,539	14,822,704
1929	88,879,853	14,622,572	1935	252,027,928	19,295,365
1930	127,718,871	15,187,259	1936	287,914,078	26,898,920
1931	112,882,625	9,096,463	1937	322,039,208	41,716,364

NOTE: Almost entirely from nickel ores.

Table 11 - PRODUCTION OF METALS OF THE PLATINUM GROUP FROM ONTARIO COPPER-NICKEL ORES, 1926-1937.

Year	Platinum		Palladium(/)	
	Fine oz.	$	Fine oz.	$
1926	9,471	919,349	10,024	640,178
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

(/) Includes other platinum metals except platinum.

Table 12 - WORLD PRODUCTION OF NICKEL ORE, 1932 - 1937. (/)
(in terms of metal)

Countries	1932	1933	1934	1935	1936	1937
			(short tons)			
Canada (a)	15,164	41,632	64,344	69,258	84,870	112,452
New Caledonia (b)	3,200	4,900	5,500	5,800	5,400	6,300
Greece (d)	1,053	1,344	1,200	1,200	1,380	(x)
India (c)	1,042	1,090	1,354	1,640	1,447	1,345
Norway	1,042	1,096	1,532	1,677	1,400	(x)
Russia	...	...	951	2,016	(x)	(x)

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.

Table 13 - WORLD NICKEL CONSUMPTION, 1937.
(International Nickel Co. of Canada, Ltd.)

	Per cent
Steels (Construction steels, stainless steels and other corrosion and heat resisting steels, and steel castings)	55
Nickel cast iron	5
Nickel - iron alloys	1
Nickel - copper alloys and nickel silvers	10
Nickel, brass, bronze and aluminium alloy castings	2
Heat resistant and electrical resistance alloys	3
"Monel", malleable nickel, nickel-clad, "Inconel"	12
Electrodeposition	10
Non-metallic materials for the chemical industry (nickel salts, ceramic materials, storage battery materials and catalysts)	1
Miscellaneous and unclassified	1

DEVELOPMENTS IN OTHER COUNTRIES

New Caledonia

There are a large number of superficial deposits scattered over the island and these occur in the peridotites altered to serpentine and in which the nickel is in the form of garnierite and noumeite, hydrous silicates of nickel and magnesium. It is estimated that a total of 5 million tons of this ore has been mined with a nickel content of 220,000 tons, the ore averaging 4.4 per cent nickel.

Shipments of ore began in 1875 and up to 1910 amounted to 1.7 million tons. Because of the high freight rates, only the ore above 6 percent nickel could be exported. In 1910 the first reduction plant was built on the island and a nickel matte containing from 40 to 50 percent nickel was produced for export. Thus shipments of ore were gradually reduced from 150,000 tons in 1911 to zero by 1921. In 1916 a start was made to produce a higher grade matte and since 1920 the matte exported has had a content of from 77 to 78 percent Ni.

Production	1929	1932	1935	1936	1937
Ore	135,000	92,100	171,000	196,000	249,000
Matte (exports)	5,471	3,915	7,039	6,075	6,830

There are two principal productive groups of mines, the most important being that at Voh-Koné on the southeast side of the island and includes the Guerioum, Bilbouet, A.S., and Advance Caledonia Mines. The other group is that of Thio on the northwest side and includes the Zizette, St. Martin II E., Emma, and Petit Bel-Air

Mines. There are two other mines, the Ouli-Ouli at Kua and the "Plum" group of prospects at Poro on the northwest side of the island, which have been reopened recently by a Japanese company and the ore is shipped to Japan.

Formerly there were three smelters, one at Thio, one at Yate on the northwest side of the island, and the third at Noumea on the southeast. Only the smelter of Doniambo at Noumea was in operation in 1936. It is planned, however, to start up the plant at Yate where there is a waterfall which will yield 25,000 H. P.

The furnaces at these smelters are from 100 to 150 tons daily capacity. Ground gypsum is added to the nickel concentrates and this mixture is made into briquets before it is introduced into the blast furnaces which produce a matte with 40 to 50 percent nickel. The addition of gypsum is necessary to supply the required amount of sulphur for the matte. This matte goes to the Bessemer convertors in which it is readily reduced to nickel sulphide with 78 percent nickel and the slag from these furnaces is returned to the blast furnaces as a flux. Thus the only metal loss is that in the slag from the blast furnaces and contains about 0.6 percent nickel. At the smelters 0.4 tons coke and 0.1 tons gypsum are used per ton of ore smelted.

Electric furnaces for direct treatment of the ore were introduced at the Yate plant and good results were obtained, the consumption of power being 1,200 Kw. Hr. and that of electrodes 12 kg. per ton of ore treated. These furnaces were idle in 1936.

The nickel sulphide matte is shipped to the refineries in Europe for further treatment.

Two large companies were operating the nickel mines and plants, namely, the Soc. Caledonia and the Soc. Le Nickel up to July 1937, when the Soc. Caledonia was absorbed by the Soc. Le Nickel, with a capital of 93,500,000 francs. (Foreign Minerals Quarterly -- U. S. Bureau of Mines.)

Japan

The Toho Kinzoku Seiren Kabushiki Kaisha (Oriental Metal Refining Co., Ltd.) is being organized in Tokyo. The capital stock, amounting to ¥10,000,000, of which ¥5,000,000 will be paid in, will be controlled by the Furukawa Denki interests and the Nihon Kokan interests. The company plants to construct a nickel plant at Takkiri-kei, Karenko Province, Taiwan, capable of handling 50 tons of nickel ore daily and producing about 4,000 tons of refined nickel annually. Power is to be supplied by a 30,000-kw water power plant to be erected at the entrance to Takkiri Gorge. Water will be piped through three 10-foot aqueducts from the proposed dam at Batagan, 5 miles away. For much of the distance the aqueducts will consist of tunnels dug through the mountains. Work on the nickel refinery and dam is expected to begin about August 1938 and to be completed in March and June, 1939, respectively. Construction of the power plant will begin about November 1938 and it should be completed in the summer of 1939. Electric power from the Karenko Electric Power Co. at Karenko can be utilized if the refinery is ready for operation before the power plant. (Foreign Minerals Quarterly -- U. S. Bureau of Mines.)

Russia

"The present sources of Soviet nickel are the Ufalei and Aktyubinsk groups of nickel deposits, both in the Urals. In 1934 the proven reserves of the Ufalei group of deposits were estimated at 14,000 tons. It was calculated that unless

developments augmented substantially the available resources of the Ufalei area the Ufalei refinery, constructed in 1934 with planned capacity of 3,000 tons of ferro-nickel per year, will soon have no raw material supply for its operation.-- The proven resources of Aktyubinsk deposits in 1935 were estimated at 21,300 tons of nickel content said to amount from 1.35 to 1.65 per cent. On the basis of Aktyubinsk nickel deposits the construction of a nickel plant at Orsk was started in 1935. This plant was expected to be completed and put in operation by the beginning of 1938. It was reported that a small nickel plant in Moncha-Tundra was to be completed by the end of 1938. The construction of Noril nickel combine plant in Siberia is to be completed during the third Five-Year plan method. The Moncha-Tundra and Noril plants are to be operated on sulphurous nickel ore, which is available there in abundant quantities". (Foreign Minerals Quarterly -- U. S. Bureau of Mines.)

Finland

According to the annual report of the International Nickel Company of Canada Ltd., work on the Kaulatunturi mine in Finland was continued by the Mond Nickel Co. Ltd., throughout 1937 and $717,753.63 was expended. A substantial tonnage of ore of excellent grade has been proven by diamond drilling and prompt steps are being taken to develop the property for an output up to approximately 1,000,000 pounds of nickel and 500,000 pounds of copper per month. To open up the mine and adit must be driven, surface plant erected, housing for employees provided and hydro-electric power plant installed. To date $1,025,994.13 has been expended and it is estimated that an additional $6,000,000, of which $2,500,000 has already been authorized, will be required to complete the projected program by 1940. The plan of operation contemplated is to produce bessemer matte in Finland.

D I R E C T O R Y

FIRMS IN THE NICKEL COPPER MINING AND SMELTING INDUSTRY IN CANADA, 1937.

Name of Firm	Head Office Address	Location of Canadian plant
NEW BRUNSWICK -		
(x) Maruba Corporation Ltd.	1111 Aldred Bldg., Montreal, Que.	St. Stephen
ONTARIO -		
(x) Anglo-Sudbury Nickel Corp. Ltd.	706 Concourse Bldg., Toronto	Sudbury and Algoma Districts
(x) Denison Nickel Mines Ltd.	607 Reford Bldg., 217 Bay St., Toronto	Worthington
(x) Drury Nickel Mines Ltd.	44 Victoria St., Toronto	Drury Twp.
Falconbridge Nickel Mines Ltd.	25 King St. W., Toronto	Falconbridge Twp.
International Nickel Co. of Can. Ltd.	Copper Cliff	Mines - Twps of Levack, Snider, McKim & Garson. Smelters - Copper Cliff, Coniston Refinery - Port Colborne.
(x) Ontario Nickel Corp. Ltd.	38 King St. W., Toronto	Goward and Sudbury Districts.
BRITISH COLUMBIA -		
B. C. Nickel Mines Ltd.	Choate	Yale M. D.
(x) Western Nickel Corp. Ltd.	2 - 425 Howe St., Vancouver	Yale M. D.

(x) Active but not producing.