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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 1940

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THE NICKEL-COPPER MINING, NICKEL-COPPER SMELTING and NICKEL REFINING INDUSTRY IN CANADA, 1940

Production of nickel in 1940 from Canadian ores was the highest ever recovered, surpassing the record 1939 output of 226,105,865 pounds.

Almost the entire production of Canadian nickel in 1940 originated in the nickel-copper ores of the Sudbury district, Ontario, and represented the recovery of the metal in the refined state, in oxides and salts, and in matte exported. In addition to the nickel obtained from the Sudbury ores, there is a relatively small quantity of the metal recovered annually in the treatment of silver-cobalt ores from the Cobalt district of Northern Ontario.

Copper recovered from nickel-copper ores in 1940 represented 53 per cent of the total quantity of new copper produced from all sources in the Dominion during the year under review. The nickel-bearing deposits of the Sudbury area also contain relatively high values in platinum metals which are recovered in refining operations.

In addition to production of nickel, copper, and the platinum metals, there is an important recovery from these ores of the associated metals - silver, gold, selenium and tellurium; sulphur for the manufacture of sulphuric acid is also salvaged in the gaseous state from waste smelter gases. The total gross value of the various primary products of this Canadian industry, considered as a whole, was estimated at $103,109,213 in 1940 compared with $95,714,524 in 1939.

Two companies operated both mines and metallurgical plants in the Sudbury area in 1940. 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 treated their matte in a refinery located at Kristiansand, Norway, until the invasion of that country by Germany in 1940. Matte produced by the Falconbridge Nickel Mines Ltd. is now treated in the Canadian plants of the International Nickel Co. of Canada, Limited.

The relatively small amount of nickel oxide produced at Deloro, Ontario, is recovered from silver-coblat-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. Converter copper made by the International Nickel Co. is electrolytically refined at Copper Cliff.

The only other nickel-copper mining company to officially report work in 1940 was Nickel Offsets Limited, with properties in Foy, Bowell and Morgan townships of the Sudbury area. This Company stated that only surface exploration and road work were conducted during the period April 15 to December 15.

Capital employed in Canada by the nickel-copper mining, smelting and refining industry in 1940 was reported at $132,818,804; employees totalled 12,739 and $22,568,887 were distributed as salaries and wages. Fuel and electricity used in 1940 were valued at $9,048,885 and the cost of chemicals, explosives and other process supplies consumed totalled $13,150,095.

Table 1 - PRINCIPAL STATISTICS OF THE NICKEL-COPPER MINING, SMELTING AND REFINING INDUSTRY IN CANADA, 1938 - 1940 (x)

	1938	1939	1940
Number of firms	(f) 9	(e) 4	(a) 3
Number of mines	12	7	6
Number of smelters	3	3	3
Number of copper refineries	(g)	1	1
Number of nickel refineries	1	1	1
Capital employed	$ 111,947,698	128,302,729	132,818,804
Number of employees - On salary	329	341	928
On wages	10,075	11,153	11,411
Total	10,404	11,494	12,339
Salaries and wages .. Salaries	$ 1,114,511	1,195,565	2,623,307
Wages	$ 17,122,883	19,362,273	19,945,580
Total	$ 18,237,394	20,557,838	22,568,887
Fuel and purchased electricity used (c)	$ 6,675,789	7,437,370	9,048,885
Process supplies used (b)	$ 10,778,672	12,068,595	13,150,095
Estimated gross value of matte exported and Canadian refinery products (d)	$ 96,309,239	95,714,524	103,109,213
Value of production less items (b) and (c)	$ 78,854,778	76,208,559	80,910,233

(x) Does not include data for mines, power plants, etc., operated by subsidiary companies, data for copper refining in Ontario included in 1939 and 1940 but not in previous years.
(a) All in Ontario.
(d) Data for 1938 represents the value of products made in Canada from new or primary material only and does 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; value added in electrolytic copper refinery included in 1939 and 1940 but not in previous years.
(e) 3 firms reported as active in Ontario and 1 in British Columbia.
(f) 7 firms in Ontario, 2 in British Columbia.
(g) In existence but not included as part of the nickel-copper mining, smelting and refining industry prior to 1939.

Table 2 - OUTPUT FROM CANADIAN NICKEL-COPPER MINES AND SMELTERS, 1938 - 1940
(Short tons)

	1938	1939	1940
Ore shipped from mines	6,276,232	7,850,636	Not
Ore and concentrates treated(*)	6,280,283	7,839,187	
Blister copper produced in Ontario(a)	147,439	155,860	available
Nickel produced in Ontario(b)	62,141	65,883	
Matte exported(c)	63,423	71,315	for
Nickel content of matte exported	43,075	47,057	
Copper content of matte exported	6,914	8,212	publication

(*) Represents the tonnage of crude ore smelted together with the tonnage of ore milled.
(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 and in 1940 exclusive of anode copper exported.

Table 3 - NUMBER OF WAGE-EARNERS EMPLOYED, BY MONTHS, 1932, 1936, 1939, and 1940

Month	1932	1936	1939 /	1940
January	3,014	8,076	10,361	11,345
February	3,019	8,044	10,355	11,402
March	3,039	8,104	10,627	11,483
April	2,577	8,191	10,952	11,458
May	2,379	8,257	11,287	11,441
June	2,434	8,411	11,428	11,502
July	2,235	8,653	11,373	11,428
August	1,672	8,804	11,496	11,342
September	1,628	8,606	11,281	11,339
October	1,580	8,700	11,235	11,364
November	1,490	8,735	11,687	11,493
December	1,551	9,050	11,757	11,344

/ Includes Ontario copper refinery data for the first time in 1939.

Table 4 - NUMBER OF WAGE-EARNERS WHO WORKED THE NUMBER OF HOURS SPECIFIED, DURING ONE WEEK IN MONTH OF NORMAL EMPLOYMENT, 1940

Hours per week	Number
30 hours or less	...
44 hours	71
45 - 47 hours	1,129
48 hours	9,626
49 - 50 hours	307
51 - 54 hours	373
55 hours	34
56 - 64 hours	292
65 hours and over	18
GRAND TOTAL	11,850
Total wages paid in week to employees specified $	395,996

Table 5 - FUEL AND ELECTRICITY USED FOR LIGHT AND POWER, 1939 and 1940

Kind	Unit of measure	1939 Quantity	1939 Cost at works	1940 Quantity	1940 Cost at works
			$		$
Bituminous coal - Canadian	short ton	1,455	9,062	7,669	46,145
Imported	short ton	35,808	216,638	33,452	214,088
Anthracite coal - U.S. ...	short ton	66	850	11	195
Other ..	short ton	178	2,845	162	2,666
Coke	short ton	262	2,581	482	5,062
Gasoline	Imp. gal.	84,473	15,722	104,615	20,387
Kerosene	Imp. gal.	10,081	1,932	9,271	1,835
Fuel oil and diesel oil ..	Imp. gal.	339,862	31,872	543,143	51,188
Wood	cord	...	...	87	527
Electricity purchased	K. W. H.	514,179,542	1,413,726	496,363,408	1,724,329
TOTAL	$	...	1,695,228	...	2,067,022
Electricity generated for own use	K. W. H.	7,907,650	...	8,805,900	...

Table 6 - FUEL AND ELECTRICITY USED FOR METALLURGICAL PURPOSES, 1939 and 1940

Kind	Unit of measure	1939 Quantity	1939 Cost at works	1940 Quantity	1940 Cost at works
			$		$
Bituminous coal - Canadian	short ton	316,749	1,760,788	323,481	1,870,966
Imported	short ton	118,510	686,883	148,832	925,389
Coke	short ton	215,613	2,041,088	261,640	2,591,775
Gasoline	Imp. gal.	4,332	904	15,599	2,184
Fuel oil and diesel oil	Imp. gal.	15,041,339	651,802	16,790,921	823,146
Wood	cord	5,863	27,005	4,453	21,574
Gas - Natural	M cu. ft.	308	302	206	164
Other fuel	$	...	2,696	...	6,117
Electricity purchased	K. W. H.	196,239,559	570,674	245,481,580	740,548
TOTAL	$	...	5,742,142	...	6,981,863

Table 7 - POWER EQUIPMENT INSTALLATION, 1940

Description	Ordinarily in use: Number of units	Ordinarily in use: Total horse power	In reserve or idle: Number of units	In reserve or idle: Total horse power
Steam engines and steam turbines	19	5,539	3	1,134
Electric motors -				
(a) Operated by purchased power	3,611	184,438	241	18,247
Total	3,630	189,977	244	19,381
(b) Operated by power generated by the establishment	246	3,415	22	236
Stationary boilers	23	9,900	1	450

Table 8 - PRODUCTION IN CANADA, IMPORTS AND EXPORTS OF NICKEL, 1939

	Quantity	Value
	Lb.	$
Production -		
Nickel in matte exported) Refined and electrolytic nickel produced) Nickel in oxides and salts sold or produced	226,105,865	50,920,305
Imports -		
Nickel, nickel silver and German silver in ingots or blocks, n.o.p.	246,078	62,534
Nickel in bars and rods, strips, sheets and plates	992,282	8,751
Nickel silver and German silver in bars, rods, strips, sheets, plates or anodes	107,144	28,984
Nickel chromium in bars or rods, etc.	48,597	48,616
German, Nevada and nickel silver, manufactures of, not plated	...	161,403
Nickel-plated household hollow-ware	...	680
Nickel kitchenware	...	400
Nickel-plated ware, n.o.p.	...	890,602
TOTAL NICKEL AND ITS PRODUCTS	...	1,581,970
Exports -		
TOTAL (METAL IN ALL FORMS)	234,781,300	57,933,511

NOTE: Corresponding data for 1940 are not published.

Table 9 - PRODUCTION OF NICKEL(x) FROM CANADIAN ORES, 1926 - 1939

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	1939	226,105,865	50,920,305

(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.

Table 10 - WORLD PRODUCTION OF NICKEL ORE, 1937 - 1939 (In terms of metal) Long tons
Imperial Institute - London

Producing country	1937	1938	1939
British Empire -			
Southern Rhodesia (estimated)	4	75	480
Union of South Africa	...	44	392
Canada	100,404	94,006	100,940
Burma (b)	1,214	944	(a)
Australia	...	20	(a)
TOTAL	101,600	95,100	...
Foreign Countries -			
Italy	67	(a)	(a)
Greece (e)	951	1,188	(a)
Norway	863	1,236	(a)
U.S.S.R. (estimated)	2,000	2,500	(a)
Egypt	14	32	(a)
Morocco (French)	250	316	(a)
United States (d)	196	371	352
Brazil	102	369	25
New Caledonia (c)	11,100	12,300	(a)
TOTAL	15,500	18,000	...
WORLD'S TOTAL	117,000	113,000	...

Nickel ores are also produced in Germany and the Netherlands East Indies.

(a) Information not available.

(b) Nickel content of speiss obtained as a by-product in smelting operations.

(c) Estimated content of ore as mined. The estimated content of ore, matte, etc., exported was -- 1937 ..... 5,800 long tons
1938 ..... 7,250 long tons

(d) Nickel content of salts and nickel produced as a by-product in the electrolytic refining of copper (partly from imported blister copper).
Secondary metal was recovered in the United States as follows:
1937 ..... 2,143 long tons
1938 ..... 2,054 long tons
1939 ..... 2,607 long tons

(e) Figures represent combined totals of nickel content and cobalt content of ores.

NOTE: Complete data for 1939 and 1940 not yet available.

Table 11 - PRODUCTION OF COPPER FROM ONTARIO ORES, 1926 - 1939

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	1939	328,429,665	32,637,305

NOTE - Almost entirely from nickel ores. Total production of copper in Canada in 1939 from all ores and all provinces totalled 608,825,570 pounds valued at $60,934,859.

Table 12 - PRODUCTION(a) OF REFINED COPPER IN CANADA FOR YEARS SPECIFIED

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

✓ First electrolytic copper produced commercially in Canada. (a) From all sources.

Table 13 - WORLD PRODUCTION OF COPPER(a) 1939 - 1940 (American Bureau of Metal Statistics)

Country	1939	1940
	(short tons)	
United States	734,990	892,266
Mexico	53,790	45,003
Canada	310,257	
Cuba	11,359	11,574
Newfoundland	9,700	8,500
TOTAL ex U.S.A.	385,106	
Bolivia	4,471	7,341
Chile	373,870	388,500
Peru	39,260	40,700
TOTAL SOUTH AMERICA	417,601	436,541
Austria	(d)	
Finland	15,163	
France	x1,100	
Germany	x33,000	
Norway	21,424	
Russia	x118,000	
Spain and Portugal	28,439	
Sweden	10,582	
Yugoslavia	45,920	47,346
Other Europe	7,716	
TOTAL EUROPE	281,344	

Table 13 - WORLD PRODUCTION OF COPPER(a) 1939 - 1940 (American Bureau of Metal Statistics) - (Concluded)

Country	1939	1940
	(short tons)	
Japan	*84,900	
India, inc. Burma	11,119	
Turkey	7,425	
Philippines	5,739	10,080
Other Asia (c)	37,699	
TOTAL ASIA	146,882	
Belgian Congo	135,196	
Rhodesia	238,100	
Other Africa	20,146	
TOTAL AFRICA	393,442	
Australia	26,000	
Other Countries (b)	(b)	
TOTALS ex U.S.A.	1,650,375	
GRAND TOTAL	2,385,365	

(a) So far as possible, these statistics are based on blister copper plus new copper going to direct production of sulphate, referred to countries wherein ore originated, with exclusion of copper derived from junk.
(b) The figures were reallocated.
(c) Includes Cyprus.
(d) Included with Germany.
* Conjectural.

Table 14 - PRODUCTION OF METALS OF THE PLATINUM GROUP FROM ONTARIO COPPER-NICKEL ORES, 1927 - 1939

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
1939	148,877	5,221,712	135,402	4,199,622

(a) A relatively small quantity of alluvial platinum is recovered annually in British Columbia; such recovery in 1939 totalled 25 ounces valued at $877.
(/) Includes other platinum metals except platinum.

International Nickel Company reported that world consumption and production of platinum group metals in 1939, the last year for which data are available, were estimated to have been substantially in balance at about 500,000 ounces. Increased demand for platinum metals during the year was apparently well distributed among the principal markets, although industrial requirements were somewhat more active than jewellery and other ornamental requirements. The Company's platinum metals were sold principally in the United States and in the United Kingdom. The production and use have been established of platinum-clad base metals in the form of sheet, strip and tubing suitable for chemical manufacturing equipment and other purposes where substantially incorrodible platinum surfaces are required at minimum cost. A new development occurred during 1939 in the rayon industry, where platinum-rhodium spinnerets have taken the place of the older platinum-gold spinnerets. Platinum has continued its progress in the glass fibre industry, where it is used for extrusion dies and feeder apparatus. In the electrical and allied fields, palladium, platinum and their alloys, used for relay contacts and other purposes, play an increasingly important role. The conservation of gold by many countries is assisting the demand for platinum metals, particularly palladium, and the use of palladium as a substitute for gold alloys for dental restorations, pen points and jewellery articles is making substantial headway. Platinum metals requirements for jewellery during 1939 were perhaps equal to those for 1938.

Canada is at present the largest world producer of the platinum metals. In 1938, the last year for which complete data are available, the output of the principal producing countries was as follows: Canada, 292,203 fine ounces platinum metals; Russia, 120,000 ounces crude platinum; Union of South Africa, 58,734 ounces (crude and fine) platinum metals, and Colombia 29,460 ounces crude platinum. The United States, in 1938, reported a production of 42,043 ounces of crude platinum from placers; 7,247 troy ounces from domestic ores, etc. (refineries); and 64,291 troy ounces of secondary platinum metals. The United States is an important refining centre of both domestic and foreign platinum metals.

Table 15 - WORLD PRODUCTION OF PLATINUM METALS (Imperial Institute, London)
(Troy ounces)

Producing Country	1938	1939
BRITISH EMPIRE		
Sierra Leone -		
Crude platinum	180	83
Union of South Africa -		
Crude (Pt. metals content)	18,256	18,068
Concentrates (Pt. metals content)	35,124	41,243
Osmiridium (crude) (c)	5,354	7,031
Canada -		
Crude platinum (Pt. content)	16	23
Recovered from Ontario nickel-copper matte:		
Platinum	161,319	148,877
Other platinum metals	130,893	135,402
New South Wales -		
Crude platinum	(a)	...
Tasmania -		
Osmiridium (crude)	191	283
New Zealand -		
Crude platinum	1	13

Table 15 - WORLD PRODUCTION OF PLATINUM METALS (Imperial Institute, London)
(Troy ounces) - (Concluded)

Producing Country	1938	1939
BRITISH EMPIRE (Concluded)		
Papua -		
Crude platinum	...	...
Osmiridium (crude)	22	...
FOREIGN COUNTRIES		
U.S.S.R. -		
Crude platinum (estimated)	120,000	...
Abyssinia (b) -		
Crude platinum	(a)	...
Belgian Congo -		
Palladium	225	...
Platinum	1,575	...
United States (d)		
Crude platinum	40,932	35,060
Ore (Pt. metals content)	90	66
New platinum metals recovered by refineries from gold and copper ores of domestic origin -		
Platinum	3,761	5,270
Palladium	3,429	3,330
Iridium, osmiridium, etc.	57	34
Colombia -		
Crude platinum	29,460	(e) 39,070
Panama -		
Crude platinum	...	...
Japan -		
Crude platinum	(a)	...

(a) Information not available.
(b) Amount registered, which is probably not total production.
(c) It is estimated by the Department of Mines, Union of South Africa, that the osmiridium sold during these years contained the following amounts of metals mentioned below (fine ounces)

	1938	1939
Osmium	1,701	...
Iridium	1,563	...
Ruthenium	813	...
Platinum	634	...
Rhodium	30	...

(d) Secondary platinum metals recovered in the United States were as follows, (troy ounces):

	1938	1939
Platinum	44,654	45,432
Palladium	13,489	13,039
Iridium	2,150	3,150
Other platinum metals	3,998	1,822

(e) Exports.

Production of selenium in 1939 from copper-nickel ores totalled 126,930 pounds; this was recovered at Copper Cliff, Ontario, in the electrolytic refining of converter copper made by the International Nickel Company of Canada. No production of tellurium from nickel-copper ores was reported in 1939; however, a relatively small quantity was recovered in 1940. Statistics pertaining to the production of selenium and tellurium in 1940 are not available for publication.

DIRECTORY

FIRMS IN THE NICKEL-COPPER MINING AND SMELTING INDUSTRY IN CANADA, 1940

NOTE: (x) Active but not producing.

Name of Firm	Head Office Address	Location of Canadian plant
ONTARIO -		
Falconbridge Nickel Mines, Ltd.	25 King St. W., Toronto	Falconbridge Tp.
International Nickel Company of Canada, Limited	Copper Cliff	Mines - Tps. of Levack, Snider, McKim and Garson. Smelters - Copper Cliff and Coniston. Nickel refinery - Port Colborne. Copper refinery - Copper Cliff.
(x) Nickel Offsets Ltd.	Room 1701 .. 372 Bay St., Toronto	Foy, Bowell and Morgan Tps.

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