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	THE NIGNEL-UPPERS MINIPUS. SMELLING AND REFINIRG INDUSTRI IN CANADA, 1952.

Finally revised statistics on nickel production in Canada during 1932 as reported by the Mining, Metallurgical and Chemical Branch of the Dominion Bureau of Statistics at Ottawa, show an output of 30.327.968 pounds valued at \$7,179.862 as compared with 65,666,320 pounds worth \$15,267,453 in 1931 and 103,768,857 pounds at 24,455,153 in 1930 The 1932 production represents a decline of 53.8 per cent in quantity and 53.0 per cent in value from the preceding year and 70.8 per cent in volume and 70.6 per cent in value from 1930 This persistent falling-off in nickel output during recent years is but consistent with the declining productions of practically all other industries and not only reflects the strongly entrenched position which the metal had attained under normal conditions but emphasizes its widespread and alcost phenomenal emption in industry and art.

Production of nickel during the first six months of 1933 amounted to 22.802.434 pounds as compared with 21.162.786 pounds for the corresponding period of 1932. During the first two months of 1933 production was considerably less than for January and February of 1932. Outputs for March and April were somewhat higher and production in May and June showed such a marked improvement that the total for the first half of 1933 was higher than for the corresponding period of the preceding year

Mickel production figures as given for 1932 include the nickel in matte exported by the International Nickel Company of Canada, Ltd., and the Falconbridge Mickel Mines Ltd : end refined metallic nickel and nickel in nickel oxides and salts made by the International Nickel Company at Port Colborne, Ontario, and valued at the average price obtained for these products as sold during the year. The figures for the relatively small quantities and value of nickel contained in oxides shipped by the Deloro Smelting and Refining Company, Deloro, Ontario, are also included in the totals for the Dominion

Practically all of the nickel produced in Canada comes from the coppernickel bearing deposits of the Sudbury district. Ontario Two companies operate mues and metallurgical plants in this area. The International Nickel Company of Canada, Ltd. conduct smelting operations at Copper Cliff and Coniston, Untario, while Falconbridge Nickel Mines Ltd. smelt their ores at the Falconbridge mine located a few miles east of the town of Sudbury. This company ship their matte to Norway for refining in its plant at Kristiansand. The nickel oxide produced at beloro, Ontario, is recovered from silver cobalt-nickel arsenic ores mined in Northern Ontario

Selter matte made by the International Nickel Company is treated at plants located at Clydach Wales; Huntington, West Virginia U.S.A. and at Port Colborne, Ontario During 1932 the company mined a total of 666.468 tons of ore, comprising Frood mine. 513 590 tons; Creighton mine. 96.850 tons; and Carson mine, 16 028 tons Frood mine development to date, including shafts, drifts, crosscuts,

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raises, winzes and box holes, aggregates 137,515 feet or approximately twenty-six miles. During 1932, 10,337 feet of this total were accomplished. There are now sixty eight stopes prepared in this mine to yield 150 tons per day per stope. The Creighton and Garson mines were operated at minimum capacity during the first seven months and were inactive during the remainder of the year. Conforming to the policy of curtailment, development work in all mines was restricted and exploratory work entirely suspended. Mill operations were greatly curtailed at Copper Cliff in 1932, there being only 579,640 tons of ore milied. Definite metallurgical advances were, however, made and experimental work continued. Three reverberatory furnaces were operated until the end of March after which two furnaces were used for the balance of the year. The amelter treated 336,215 tons of dry concentrates and produced 27,033 tons of bessemer matte and 27,770 tons of blister copper. The Orford process plant was started here in March, 1932, and ran intermittently as required. This plant treated 11,370 tons of bessemer matte and produced 6,651 tons of matte for refining at Port Colborne and 2,249 tons of blister copper. The Coniston smelter after operating from January to July was closed for the rest of the year. During its period of operation 90,606 tons of ore were smelted and 9,679 tons of bessemer matte produced. At the Port Colborne refinery two electrolytic units operated from January 1st until August 1st when operations were suspended. The refinery produced 14,125,388 pounds of nickel in the form of electrolytic cathodes and nickel in oxide, The output of nickel at the Clydach refinery was 7,416,464 pounds compared with 16,546,740 pounds for 1931, a decrease of 55 per cent. The plant operated continuously on a reduced scale for the first six months of the year, the pellet nickel department being closed from July 1st until the middle of December when operations were resumed. Owing to the reduced scale of operations at Port Colborne and Clydach the supply of precious metals concentrates which form the raw material for the company's refinery at Acton, England, was greatly reduced entailing a corresponding reduction in the output of platinum and palladium. Platinum production was 26,213 ounces compared with 44,725 ounces for 1931 and the output of palladium fell from 39,313 ounces in 1931 to 29,496 ounces in 1932. Operations by Henry Wiggin & Co. Ltd., England (a subsidiary of the Mond Nickel Co. Ltd.) and including since October, 1932, the business formerly carried on by Monel-Weir Ltd., were on a substantially increased scale over 1931, the nickel contained in all sales showing an increase of 17 per cent. The wire department was kept busy throughout the year and the spoon and fork department production increased fifty per cent over 1931. Owing to tariff and currency changes an increasing amount of "monel metal" was produced by this firm to supply the British home and colonial market, and to a more limited extent, the continental market. Birmingham Electric Furnaces Ltd, (a subsidiary of the Mond Nickel Co. Ltd., England) report that its works was again extended in order to care for an increased volume of business. Sales for 1932 were greatly in excess of those in 1931 and were nearly equal to those for the years 1929, 1930 and 1931 combined. The operations of this company returned a net profit for the year in addition to creating a demand for the nickel products of Henry Wiggin & Co., Ltd. The Huntington works of the International Nickel Co. Ltd. operated continuously in the United States during 1932 at a rate approximately 65 per cent of that for the preceding year, consequent upon the acquisition of Monel-Weir Ltd., this works produced an increasing amount of semi-finished "monel metal" (ingots, blooms, etc.) for finishing in the works of Henry Wiggin & Co. Ltd., England. The total number of employees of the International Nickel Co. of Canada and its subsidiaries on December 31, 1932, was 4,342 distributed as follows: Canada, 1,402; Great Britain, 2,086; United States, 813; other countries, 41. Proven ore reserves of the company as at December 31, 1932, were 203,909,973 tons. Because of this adequate tonnage of available ore the company deemed it unnecessary to carry on other than a minimum of development work. Sales by the International Nickel Company of nickel in all forms, including nickel in alloys, amounted to 34,406,953 pounds in 1932 compared with 55,739,047 pounds in 1931, a decrease of 38 per cent. The world's consumption of nickel in all forms aggregated 57,000,000 pounds as against 73,000,000 pounds in 1931 and 88,000,000 pounds in 1930.

Falconbridge Nickel Mines Ltd., report that one reserves had increased to 2.9 million tons averaging 2.25 per cent nickel and .93 per cent copper. Of this tonnage over two million lie above the present bottom of the mine (1,000 feet) and promise approximately eleven years life at the rate of 200,000 tons per year. The remainder of the reserve tonnage lies beneath the 1,000 foot level and was intersected by diamond drilling; present workings cover but a fraction of the company's holdings known to be ore-bearing.

The company report 144,090 tons of ore hoisted from stopes and 15,483 tons from development, ar a total of 159,573 tons. The smelter was in operation a total of 341 days during the year. Results tabulate as follows:-

Ore smelted	ton	123,306
Matte produced	ton	4,947.6
Nickel produced in matte	ton	2,908.17
Copper produced in matte	ton	1,196.63
Metals per ton in ore:-		
Nickel	pound	50.17
Copper	pound	20,91
Metallurgical losses per ton of ore:-		
Nickel , , , , , , , , , , , , , , , , , , ,	pound	3.0
Copper anonananananananananananana	pound	1.5

Sales of Falconbridge Nickel aggregated 7,844,648 pounds in 1932 and copper was sold practically as produced, the company's cathodes having met with acceptance in Scandinavia particularly.

Satisfactory progress was made on the construction of a 250 ton concentrator, sintering plant, smelter extension and the necessary additions to the crushing plant and ore bins that would be required to synchronize these units to effect increased capacity. The smelter operated with the normal minor interruptions throughout the year, with the exception of an eleven days shutdown in December to lengthen the blast furnace. The refinery in Norway operated satisfactorily without any close down during the year and with a somewhat increased production which during the last months of 1932 reached nine metric tons daily. The department for concentrating of precious metal slimes was working regularly during the year and shipments of concentrated alines took place at suitable intervals; at the end of the year construction was advanced for increasing the capacity of the refinery by 1,000 metric tons annually. For the year 1932 the amount of matte received from the smelter, the refinery production, the metals in process and the matte on hand at the end of the year is set out in the following table.

		0 0 N 1	ENTS
	Short ton	Nickel	Copper
		Pound	Pound
Palconbridge matte received less refinery losses	4,859.6	5,527,518	2,236,299
year		5,408,373	2,288,897
Metals in process at end of year		1,208,104	334,958
Matte on hand at end of year	22.707	26,077	11,676

B. C. Nickel Mines Ltd., reported only surface and other assessment work for 1952 on its nickel bearing deposits located at Choate, British Columbia.

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At the Annual Banquet of the Canadian Institute of Mining and Metallurgy held in Toronto, April 6, 1933, Mr. Robert C. Stanley, President of the International Nickel Company of Canada, Ltd , stated: - There is sufficient nickel ore in Canada to carry on the industry at the rate of its peak production in 1929 for the next hundred years. Furthermore the industry has become a world industry that is predominantly Canadian since in an average year over 90 per cent of the world's nickel supply originates here in Canada . In the past five years Canadian companies have sold 203,000 tons of nickel. The distribution of this large tonnage during the period mentioned is significant. The United States consumed approxiately 532 per cent; Great Britain. 92 per cent; Germany. 92 per cent; France. 72 per cent; Russia, 7 per cent; Japan, 3 per cent; Italy, 22 per cent; unclassified, 7 per cent, and Canada, per cent. . . During that time, which includes a period of great business activity and three years of serious depression, the nickel industry expended, solely for Canadian products and services, \$49,000,000 in wages and salaries, \$61,000,000 for supplies and upkeep, \$18,000,000 to Canadian railroads and utilities. In addition the dividend payments to Canadian shareholders during the same period amounted to more than \$12,000.000

Principal Statistics of the Nickel-Copper Mining and Refining Industry in Canada, 1931 and 1932.

	1931	1932
Number of firms	3	3
Number of mines and a consecutive and a second	6	6
Number of smelters approximation and a second secon	3	3
Number of refineries	1	1
Capital employed accessos accessos accessos accessos \$	76.702,948	78,188,204
Number of employees On salaries	194	188
On wages	4,106	2,218
Total	4,300	2,406
Salaries and wages Salaries	716.224	611.496
Wages	6,288,179	3,309,099
Total	7,004,403	3,920,595
Estimated value of matte exported and refinery		7.1m
products produced	27,709,234	14,003,637

Fuel and Electricity Used in the Nickel-Copper Mining, Smelting and Refining Industry in Canada, 1931 and 1932

	1 9	3 1.	1 9	3 2	
Unit of		Cost at		Cost at	
measure	Quantity	works	Quantity	works	
		\$		\$	
Bituminous coal - Canadian, ton		6.0	414	2,701	
Imported ton	1.58,403	823,776	6 -435	35,954	
Anthracite coal ton	1.29	2,173	327	5,043	
Coke (for fuel only) ton	10	115	801	7,257	
Gasoline (exclusive of			· · · · · · · · · · · · · · · · · · ·		
motor vehicles) Imp.ga	1. 8,473	1 940	4.984	1. 325	
Kerosene	1. 5,323	1,176	4,797	960	
Fuel oil and diesel oil Imp ga	1. 4.874, 265	253, 373	1,949,693	73,831	
Wood	1,300	12,187	1,525	7 968	
Gas natural M cu.f	t, 222	186		1 247	
Electricity purchased K.W.H.	219,833,888	546.604	160,322.892	<u>510 I44</u>	
Ψ()ΨΔΙ.		1 611 530		654 844	

In addition 32.484 tons of coke valued at \$300.796 and 75,197 tons of imported bituminous coal worth \$416.345 were consumed as furnace charges in 1932

		1931	1932
Ore shipped Content of ores, etc. shipped	ton	1,689,874	790,614
Copper Nickel Ores, concentrates treated at smelters	1b. 1b. ton ton	123,641,190 89,424,886 1,884,959 100,273	92,144,651 39,001,127 793,552 41,660
Content of mattes Copper Nickel Matte shipped to Canadian refineries Matte shipped to foreign smelters	lb. lb. ton ton	77,621,143 81,285,931 63,076 <u>30,294</u>	32,353,240 33,871,440 6,651 21,778

Production in Canada and Exp	orts of Nic	kel, 1931 and	1932.	
	1 9	3 1	1 9	,3 2
	Quantity	Value	Quantity	Value -
		14 A		\$
PRODUCTION -				
Nickel in matte or residues exported(a);			
refined and electrolytic nickel				
produced; and nickel in oxides and				
salts sold	65,666,320	15,267,453	30, 327, 968	7,179,862
EXPORTS -				

Nickel, fine	16	27,132,700	7,140,420	15,165,500	4,022,748	
Nickel contained in ore, matte						
or speiss	1b	33,287,600	6,048,508	15,169,200	2,757,713	
Nickel contained in oxide	1b.	3,108,300	992,637	1,737,200	503,503	
TOTAL	1.b.,	63, 528, 600	14,181,565	32,071,900	7,283,964	-
(a) Nickel in matte exported val	ued	at 18 cents pe	r pound			

Exports of Nickel from Norway, 1932.

Kg.

France	313,003
Italy .	157,259
Soviet Union	892,733
Great Britain and Northern Ireland	252,016
Sweden	228,845
Germany	62,658
United States	845,366
Japan and Korea	1,320,753
Other countries	15,678
TOTAL	4,088,311

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Output from Nickel Copper Mines and Smelters, 1931 and 1932.

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100 Va

Exports of Nickel from France, 1932.

	<u>100 ng</u> .
Matte, speiss, pigs, etc.	2,336
Hammered or rolled	121
Alloyed with copper, with or without zinc -	9T
Ingots or blocks	332
Hammered or rolled	725
Wire	194

World Production of Nickel Ore(/) 1929 - 1932. (in terms of metal) (iong tons)

Producing country	1929	1930	1931	1932
BRITISH EMPIRE				
Canada	49,230	46.325	29.315	13.539
India (b)	830	951	879	(a)
Australia	85	118	(1 cwt.)	(a)
TOTAL	50,100	47,400	30,200	(a)
FOREIGN COUNTRIES				
Greece	254		(a)	(a)
Norway	431	862	523	(a)
United States (d)	306	275	333	(a)
New Caledonia (a)	4,300	4,800	3,800	4,464(e)
TOTAL	5,300	5,900	4,700	(a)
WORLD'S TOTAL	55,000	53,000	34,900	(a)

(A) Supplied by Imperial Institute,

(a) Information not available.

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

(c) Estimated content of matte and ferro-nickel obtained at smelters.

(d) Nickel content of salts and nickel produced as a by-product in the electrolytic refining of copper.

(e) Estimated on ore production by American Bureau of Metal Statistics.

"Metaligesellschaft" reports the world's 1932 production of nickel in ore, (in thousands of metric tons) as follows: Norway, 0.5; Greece, 0.7; Other European countries, 0.4; Asia (Burma), 1.0; Canada, 17.7; United States, 0.3; Oceania (New Caledonia), 4:0; or a total of 24.6.

-7-DIRECTORY

Firms in the Mickel-Copper Mining and Smelting Industry in Canada, 1932.

e of Firm	Head Office Address	Location of
		Canadian nlants

(x) D. C. Blokel Mines Ltd.

Nan

Falcombridge Mickel Mines Ltd. International Nickel Co. of Canada, Ltd.

922 - 510 Hastings St M , Vancouver, B.C. 100 Adelaide St.W., Toronto, Ont.

Copper Cliff, Ont

Choate, B.C. Falconbridge Tp.

Copper Cliff, Ont. Coniston, Ont. Port Colborne, Ont.

(x) Operating but not producing.

GENERAL REVIEW

The Chemical Trade Journal and Chemical Engineer, London, states that afforts are to be made to develop the French nickel industry. At one time New Caledonia was one of the most important factors in the world nickel trade but in recent years has only been responsible for about 15,000 tons of ore a year. According to the new plans the ore is to be concentrated by a new electrolytic process at the mines. The further working up, hitherto effected at Le Havre is to be undertaken at a large new plant which the "Le Nickel Company" is to erect in the Pyrenees. The company has obtained a concession to the water power of two falls in the region of Production should be commenced at these new works in about three years. Pierefitte

The same Journal reports that important finds of nickel ore have been made recently in the Petsamo district of Northern Finland. The largest reserves discovered se far are at Kaulatunturi and are believed to contain about 1,600,000 tons of ore with an average nickel content of about 1.43 per cent and a copper content of about 1.29 per cent. It is far from certain, though, that the largest and best fields have yet been discovered, for the prospecting operations are still comparatively in their infancy whilst occurrences of ore containing as much as 4.36 per cent of nickel and 7.95 per cant of copper have been found on individual diamond drillings.

Production of nickel ore in Norway in 1932 totalled 150,000 tons indicating expansion of smelting activity as none of the one is exported, according to Marquard I Lund. U.S. Commercial Attaché at Uslo

H. M. Customs, United Kingdom, have issued import duties (exemptions) (No.7) Order 1933, under which nickel, unwrought, in ingots, cathodes, cubes, pellets, shot and grain, but not including alloys of nickel, are transferred to the Free list under Import Duties Act, 1932, as from July 7.

"Chemical Age" states that extensive advantages are being claimed for the process of fabricating articles in nickel and nickel alloys by sintering finely divided nickel powder to compact form. The powder in question is produced from rickel carbonyl. Its high degree of purity and freedom from contamination ensured by the use of lower temperatures and the elimination of the melting operation, gives good workability and mechanical and physical properties of very high order to the final sintered product. The commercial practicability of the process has already been demonstrated in the manufacture of wire, strip and sheet



The wide variety of industries which pure nickel now serves was emphasized during 1932 by the relatively large tonnages going into two such entirely diversified fields as alkali, rayon and plastic manufacture and the construction of radio tubes, according to an article in Contract Record and Engineering Review Distinguished primarily for its strength and resistance to corrosion, the metal has found its chief application in the chemical and food products industries. The application of nickel clad steel to a wide range of industries in which corrosion problems are encountered was one of the outstanding developments of 1932; nickel plating continues to require about 5 per cent of all nickel produced Demand for certain forms of solid nickel-silver increased during the year. Cast nickel silver (50%-30% nickel) went into the highest grade plumbing fixtures, marine and building hardware, decorative trim, food handling equipment, etc.; copper-nickel alloys containing 20 to 30 per cent nickel are now being used more extensively in marine work; a nickel-bronze of a gold yellow colour having a high tensile strength has been developed and is avail able in the form of rods or shapes as extruded or cold drawn. While the demand for nickel bearing heat resistant alloys was restricted in 1932, the base of consumption was further broadened, improvements in production technique have added life to these heating elements; as the direct result of curtailed operations in such basic fields as the automobile and railroad industries, the use of nickel alloy steels, like that of other metals and alloys, reached during 1932 a low point for the depression. However, the development of new applications of these alloy steels has continued and they now have a greater multiplicity of uses than ever before. A new alloyed wrought iron was developed and is now being produced which promises to broaden the field of application for wrought iron, the new nickel wrought irons have been found to lend themselves readily to welding both in the forge fire and autogenously.

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The rapid expansion of the fruit preserving industry within the last few years has involved the use of a large amount of nickel equipment because experience has shown that citric, malic and other fruit acids may be used in contact with nickel without harmful effect. Complete installations have been furnished in nickel while the fruit industry also uses malleable nickel equipment for auxiliary apparatus, including hoppers, sinks, conveyors, extraction and clarification apparatus, filter cloth and stills.

It is interesting to note that the Union of Soviet Socialist Republic states in a summary of the fulfilment of "The First Five Year Plan" that the Khalilov complex ore deposits, discovered during the first five year plan period in the middle Volga region, are being prepared for mining. These deposits contain nickel and chrome. Mining work will begin here in 1933.